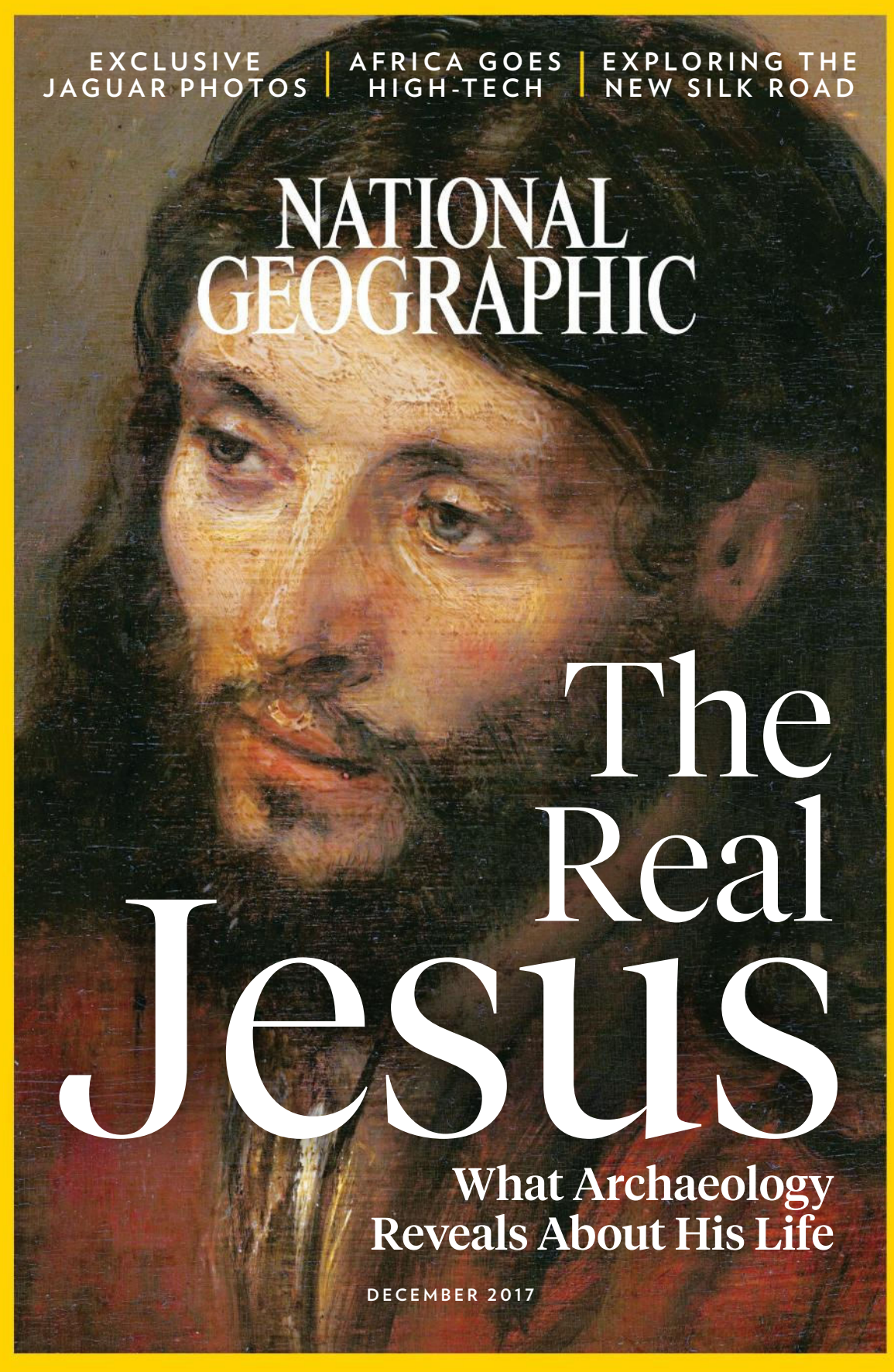

EXCLUSIVE JAGUAR PHOTOS
AFRICA GOES HIGH-TECH
EXPLORING THE NEW SILK ROAD
NATIONAL GEOGRAPHIC
The Real Jesus
What Archaeology Reveals About His Life
DECEMBER 2017



SIR EDMUND HILLARY AND TENZING NORGAY, EVEREST, 1953





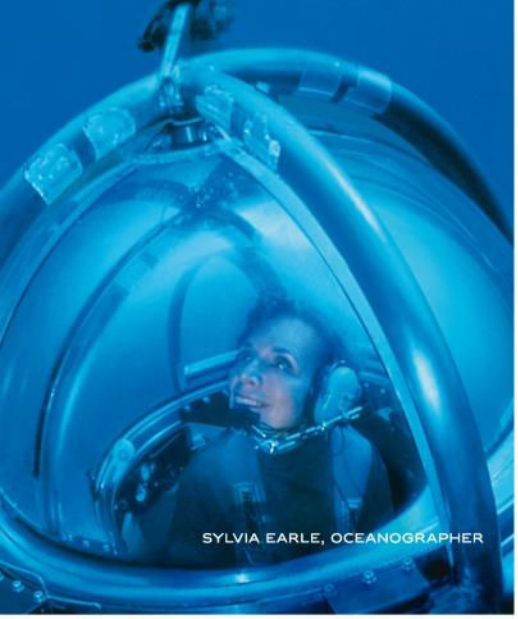


UNDER THE POLE EXPEDITIONS

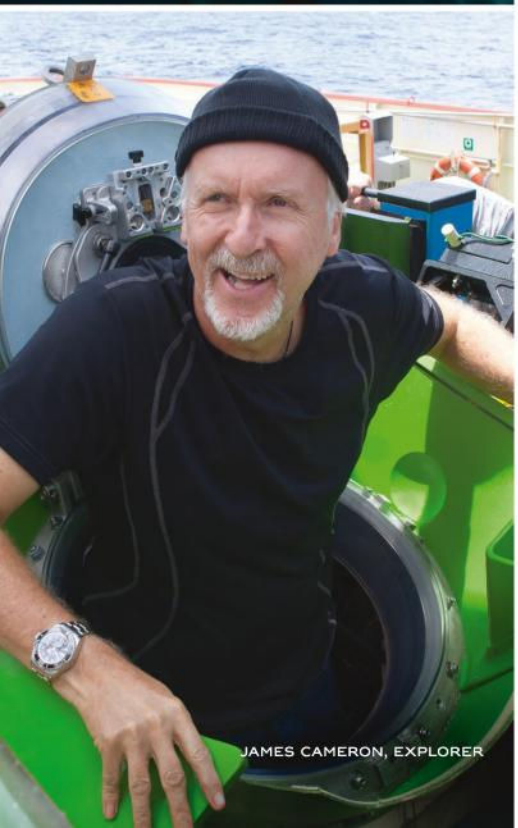


TRIESTE, 1960









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Photo: Bridgeman Images

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Go to *natgeo.com/corrections.*

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ELSEWHERE



BOOKS

SCENES FROM A 'VISUAL ATLAS'

Combine state-of-the-art cartographic technology with incomparable photography, and the result is the second edition of National Geographic's *Visual Atlas of the World.* Completely updated, this 416-page book includes 200-plus maps and more than 400 new photos, from satellite imagery to scenes of UNESCO World Heritage sites such as the Great Wall of China (left). An authoritative reference, it's available wherever books are sold and at *shopng.com/books.*

NAT GEO WILD

'BIG CAT WEEK': SEE CHEETAHS, JAGUARS

Filmmaker Bob Poole visits the world's fastest animal on its Kenyan home turf for *Man Among Cheetahs.* Two formidable predators face off in *Jaguar vs. Croc.* Watch these programs and more during Nat Geo WILD's Big Cat Week starting December 10.

TELEVISION

WARRIORS ON 'THE LONG ROAD HOME'

A platoon that was ambushed in the Iraq War, and its leaders, are the focus of *The Long Road Home* (right), a scripted series based on journalist Martha Raddatz's book of the same name. It premieres November 7 at 9/8c on National Geographic.



BOOKS

WALK 'IN THE FOOTSTEPS OF JESUS'

A lushly illustrated account of the life and times of Jesus of Nazareth, the second edition of *In the Footsteps of Jesus* takes readers to places and events that changed the world. Available wherever books are sold and at *shopng.com/books.*

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PHOTOS: ETHAN WATSON, NATIONAL GEOGRAPHIC YOUR SHOT (GREAT WALL); VAN REDIN, NATIONAL GEOGRAPHIC



Sun Parakeet *(Aratinga solstitialis)*
Size: Body length, approx. 30 cm (11.8 inches); tail, 13.2 - 15 cm (5.2 - 5.9 inches) **Weight:** 100 - 123 g (3.5 - 4.3 oz) **Habitat:** Open savanna, savanna woodlands, forested valleys and seasonally flooded forests **Surviving number:** Estimated at 1,500 - 4,000

Photographed by Konrad Wothe

WILDLIFE AS CANON SEES IT

Beauty and brains. The sun parakeet certainly has both, with eye-catching plumage and a high brain-to-body ratio. It puts this brainpower to good use in complex social interactions and vocalizations, as well as in climbing and other feats of dexterity that require precision and concentration. A prodigious consumer of fruits, this parakeet plays an important role as a seed disperser. But it is in jeopardy as numbers have fallen dramatically due to habitat loss, trapping for the pet trade, and hunting for feathers and collections.

As Canon sees it, images have the power to raise awareness of the threats facing endangered species and the natural environment, helping us make the world a better place.



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THE SEARCH FOR SIGNS OF JESUS

This month's cover story, "The Search for the Real Jesus," does what people have been doing for nearly 2,000 years: It seeks new truths about the epochal figure known as Jesus of Nazareth.

He has been called, among other things, a religious reformer, a social revolutionary, and an apocalyptic prophet. The same variety of views can be seen in depictions of his likeness—artworks that often say more about the time and place in which they were created than the individual they sought to capture.

We wanted just the right person to tell this complex story, and we found her in our own newsroom—Kristin Romey, a self-described archaeologist turned journalist who's made some 20 trips to the Middle East. Romey, who writes about paleontology and archaeology for *nationalgeographic.com* and this magazine, is committed to the work that our founders bequeathed to us: producing journalism that's honest and fair, grounded in evidence and science.

I think our story about Jesus—brought to life with the incomparable illustrations of Fernando Baptista and the photography of Simon Norfolk—achieves that goal. I hope you'll agree.

Romey told me that this assignment was different from many others she has done for us. "Most archaeological sites are cursed with a sense of romantic sterility, all crumbling ruins and stories about the great events that once took place there," she said. "They may be alive with curious visitors, yet their relevance feels as distant to modern life as far-flung stars."

But on this assignment, the ancient sites Romey visited felt very much alive. She gave an example: "I was standing in the remains of a first-century synagogue on the southern shore of the Sea of Galilee, discussing its excavation with one of the archaeologists who made the discovery in 2009. She explained its construction sequence, how it was dated, and its context within the larger town. Then she said proudly, 'And my teenage sons had their bar mitzvahs here!' "

That's the duality that Romey found: sites that are monuments of archaeological significance as well as vibrant centers of pilgrimage and faith. How gratifying, in this season of goodwill, to see the scientific and the spiritual coexist.

Thank you for reading *National Geographic*.

Susan Goldberg, *Editor in Chief*



This icon of the Madonna and Child, called "Eleftherotria," or "the Liberator," hangs in the Greek Orthodox prayer hall in Jerusalem's Church of the Holy Sepulchre.

PHOTO: SIMON NORFOLK



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Gary Knell stands before the bronze plaque of the world that was installed in 1932 in the lobby of the National Geographic Society's Washington, D.C., headquarters.

INVESTING IN SOLUTIONS

Alexander Graham Bell, the second president of the National Geographic Society, defined geography as "the world and all that is in it." In fact, National Geographic's original mission was to increase and diffuse geographic knowledge.

For many, the word "geography" elicits school-age memories of studying the names of rivers, oceans, or capitals. So it's fair to ask: Is geography relevant today?

In the roughly two years since the National Geographic Society refined our focus as a nonprofit organization, we've had an opportunity to rethink our relevance in the 21st century. The world now faces far different challenges than it did at our founding in 1888.

Today we inhabit a planet with a burgeoning population that could approach 10 billion people by mid-century. That's nearly three times as many people as 50 years ago—and it will force massive resets in how we house, educate, feed, and provide energy to people without burning up everything in or on the planet.

As National Geographic's publications have borne witness to for decades, attempts to tackle such challenges have often had crushing impacts—on wildlife, on weather patterns, on water and air, on public health, and on nations and people in conflict.

As we seek to make a difference on these issues, we'll concentrate our efforts in three distinct areas. We will double down on investing in solution-oriented innovators whose work focuses on the stresses on our changing planet, on wildlife and wild places, and on understanding the human journey, from our origins and cultures to our exploration of space.

National Geographic also will use its resources to educate kids about the 21st-century heroes at work among us: scientists and explorers, photographers and technologists, environmental and science journalists, mappers and teachers. Then we'll bring these heroes' stories to more than 730 million people worldwide, via this magazine and the digital and broadcast outlets in our arsenal.

We are excited to unleash the power of National Geographic toward making a difference. Thank you for joining us.



Gary E. Knell, *President and CEO*
National Geographic Society

PHOTO: MARK THIESSEN, NGM STAFF



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THIS TRADITION IS FOR THE BIRDS

This month **Geoffrey LeBaron,** 63, marks his 30th year as director of the National Audubon Society's annual Christmas Bird Count. Tens of thousands of bird-watchers turn out for the event, started in 1900; scientists use its data to monitor bird-population trends.



National Geographic will celebrate 2018 as the Year of the Bird. Watch for special coverage in the magazine and online.

How did the Christmas Bird Count get started?
In the 1800s there was something called a Christmas side hunt where people would choose sides and go out during the holiday and hunt. Whoever brought in the biggest pile of birds and other animals won. By the late 1800s the Audubon movement was increasing awareness for conservation. So ornithologist Frank Chapman proposed in 1900 that rather than a holiday hunt, we do a Christmas bird census.

What birds are you most eager to see?
One of the questions I get a lot is, What's your favorite bird? And my answer is, Whatever bird I'm looking at. It doesn't have to be rare. The bird I probably want to see most this year is a gull. Fifteen years ago I was doing my count in Rhode Island's Ninigret National Wildlife Refuge, and I saw this interesting-looking little gull sitting on a rock. It was an adult lesser black-backed gull, which was very unusual. Every year since then I have seen that same bird. It's on the same rock in the same cove, and it acts the same way and feeds in the same area. So it's not only about a connection with the area and birding with my friends, but this gull has become a friend of mine. I mean, I'm going to be really unhappy the year that I don't find it.

What changes has the count detected?
People tend to think of a species being at risk when there are only a few left, like California condors. But it's a lot more cost-effective to figure out what's affecting a species while it's still plentiful. One of the key things we do is look at the count data and figure out which common birds are declining. In 2009 we looked at the wintering ranges of more than 300 species and found that the area of greatest abundance for many has moved as much as 200 miles northward over a 40-year period. Documenting that enables people to go figure out what's happening to cause those changes.
Visit *audubon.org/join-christmas-bird-count.*

THIS INTERVIEW WAS EDITED FOR LENGTH AND CLARITY.
PHOTO: CLAIRE ROSEN





PREPARED FOR A LONGER RETIREMENT?

THE EXPERIMENT THAT GOT COUPLES TALKING.

We're living longer, which is great. But it means we could be underestimating how much money we'll need in retirement. The bigger concern? Most of us aren't talking about it.

So we invited couples to guess how much money they'll need in retirement using our interactive walkway. It turned out that most couples weren't on the same page and fell short of the average length of retirement. They walked away from our experiment with an important new perspective—because we're living longer, we need to start planning for longer. A good place to start? Planning for income that lasts all our years in retirement.

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VISIONS



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CHINA
Visitors navigate an ice maze at the Harbin International Ice and Snow Festival in Heilongjiang, China's northernmost province. Beginning each December, more than a million people come to admire attractions such as full-size castles, sculptures, and a 15-story ice tower.

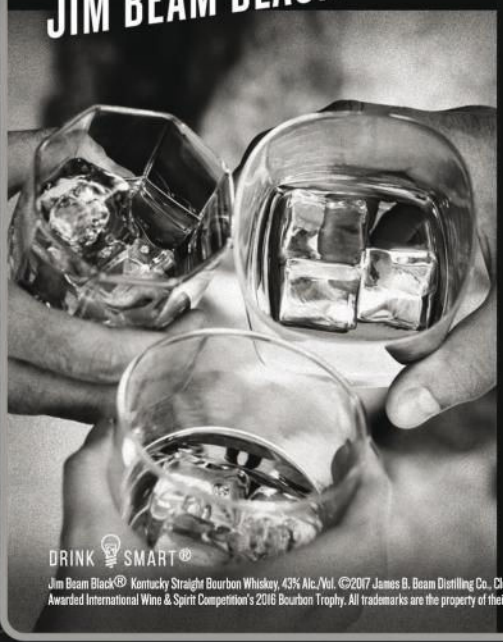
PHOTO: FRED DUFOUR, AFP, GETTY IMAGES

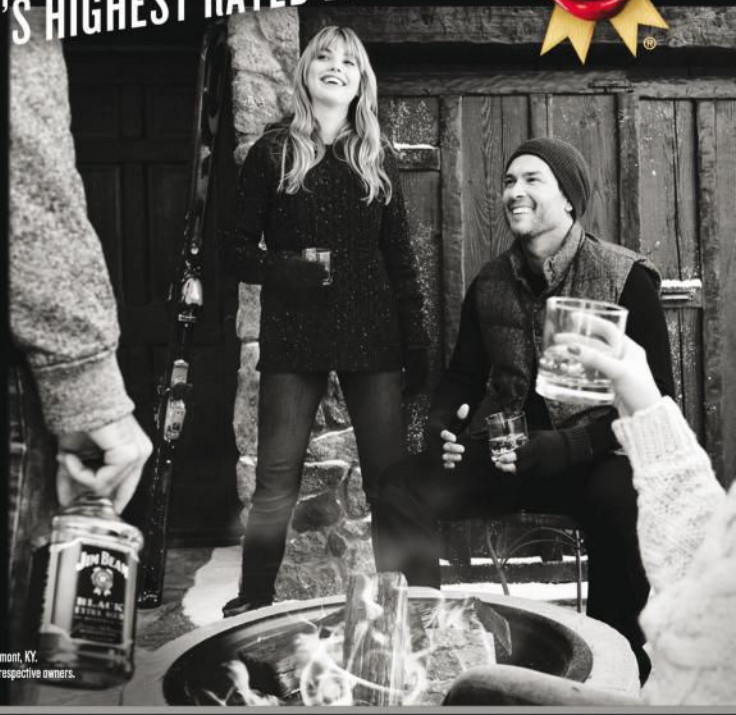


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TRADITIONS

ASSIGNMENT We asked readers to share images of their traditions. To see more photos from the Your Shot online community, visit the website listed above.

A. J. Lee
Ogden, Utah

Lee was photographing the U.S. Air Force Academy's spring graduation ceremony at its stadium in Colorado Springs, Colorado. "I've always wanted to shoot the hat toss at the end of the ceremony," says the Air Force photographer. He learned in advance where a group of jets would fly over.

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Nikon 100th anniversary

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EXPLORE
TRADITIONS



THE SMITH AND THE DEVIL
Originated 6,000 years ago
A blacksmith trades his soul to the devil for the power to weld any materials together. With his wish granted, the man traps the devil, sticking him to the ground until the evil spirit releases him from the bargain.

A BOY STEALS THE OGRE'S TREASURE
4,500 years ago
A boy trespasses into a giant's house to steal his treasure. When the giant comes home, the boy hides and then manages to evade the giant's pursuit. Finally the boy kills the giant and takes his treasure.

THE ANIMAL BRIDEGROOM
3,000 years ago
Picking a rose lands a father in debt to a beast. In exchange for his freedom, his daughter is taken prisoner. After falling in love with the beast, she must overcome a curse to transform him into a prince.

TALES AS OLD AS TIME

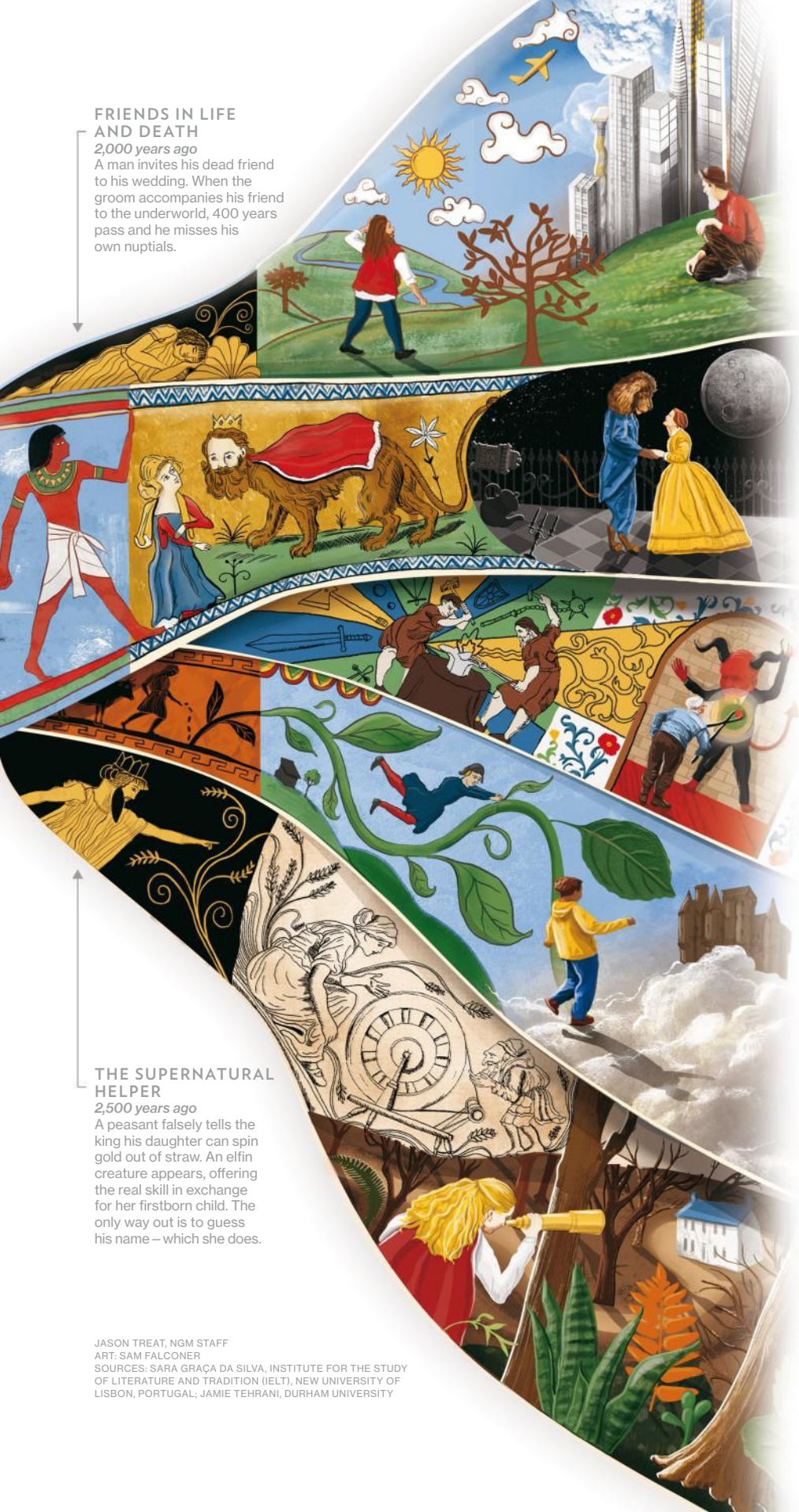
By Nina Strochlic

How does the same story come to be known as "Beauty and the Beast" in the U.S. and "The Fairy Serpent" in China?

As Wilhelm and Jacob Grimm collected Germanic folktales in the 19th century, they realized that many were similar to stories told in distant parts of the world. The brothers Grimm wondered whether plot similarities indicated a shared ancestry thousands of years old.

Folktales are passed down orally, obscuring their age and origin. "There's no fossil record [of them] before the invention of writing," says Jamie Tehrani, an anthropologist at Durham University.

To test the Grimms' theory, Tehrani and literary scholar Sara Graça da Silva traced 76 basic plots back to their oldest linguistic ancestor using an international folktale database. If a similar tale was told in German and Hindi, the researchers concluded its roots lay in the languages' last common ancestor. "The Smith and the Devil," a story about a man who trades his soul for blacksmith skills, was first told some 6,000 years ago in Proto-Indo-European. Now we tell a similar tale about the blues guitarist Robert Johnson.



FRIENDS IN LIFE AND DEATH

2,000 years ago

A man invites his dead friend to his wedding. When the groom accompanies his friend to the underworld, 400 years pass and he misses his own nuptials.

THE SUPERNATURAL HELPER

2,500 years ago

A peasant falsely tells the king his daughter can spin gold out of straw. An elfin creature appears, offering the real skill in exchange for her firstborn child. The only way out is to guess his name – which she does.

MODERN TAKES

Friends in Life and Death
A dead man accepts Don Juan's invitation to a banquet in exchange for Don Juan's attendance at another event – in the underworld.

The Animal Bridegroom
In Disney's *Beauty and the Beast*, a witch's curse traps the prince in a beast's body until Belle's love breaks the spell.

The Smith and the Devil
Fictional scholar Faust and blues guitarist Robert Johnson are among the modern figures said to have sold their souls to the devil for knowledge.

A Boy Steals the Ogre's Treasure
Magic beans grow to great heights in "Jack and the Beanstalk," allowing Jack to climb up into a giant's lair and steal his treasures.

The Supernatural Helper
Trapped in an agreement to give Rumpelstiltskin her first child, a young queen overhears him chanting his name and gets out of the deal.

JASON TREAT, NGM STAFF
ART: SAM FALCONER
SOURCES: SARA GRAÇA DA SILVA, INSTITUTE FOR THE STUDY OF LITERATURE AND TRADITION (IELT), NEW UNIVERSITY OF LISBON, PORTUGAL; JAMIE TEHRANI, DURHAM UNIVERSITY

ORNAMENTAL HISTORY

By Catherine Zuckerman

In 1929 a fire broke out on Christmas Eve in the White House during a party for children. As flames licked the walls of West Wing offices, 130 firefighters arrived and extinguished the blaze. The next year, President Herbert Hoover sent toy fire trucks to some of his young guests.

Anecdotes like these often inspire the design of the White House Christmas Ornament—a festive annual tribute to past presidents and events, conceived during the Reagan administration and managed by the White House Historical Association. Since 1982 the holiday decorations have honored each president sequentially, with brief pauses to recognize significant occasions such as the White House bicentennial anniversary in 2000.

More than a million ornaments are sold each year, with proceeds going toward publishing educational books and restoring presidential artifacts. "It's not political," says Dave Marquis, who runs the firm that has manufactured all 37 ornaments. "It's about celebrating the House itself, and the men who served."



2017: The shape of the ornament honoring **Franklin D. Roosevelt** evokes a tabletop radio – like those that broadcast the president's "fireside chats" into American homes. Roosevelt's beloved dog, Fala, sits near the Christmas tree, with the gifts. Four stars toward the top of the ornament represent Roosevelt's historic four terms as president, and the chevron border recalls the design of the card case he carried.

A DECORATED PAST

1982



This ornament honors **George Washington,** the first president of the United States. It is a replica of the dove-of-peace weather vane that he commissioned for his home at Mount Vernon.

1991



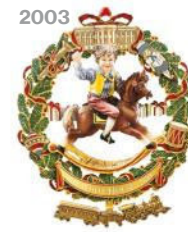
William Henry Harrison, the ninth president of the United States, rode a white charger in a large procession to take the presidential oath of office at the Capitol. He died just 31 days later.

1999



Abraham Lincoln's official presidential portrait hangs over the fireplace in the State Dining Room. The ornament's frame was adapted from a Civil War–era frame in the White House collection.

2003



This ornament commemorates **Ulysses S. Grant** and his family. A young child is surrounded by a wreath adorned with toys that were available at the time at Washington, D.C.'s, fancy goods stores.

2013



Woodrow Wilson's quest for world peace inspired this design, featuring two doves perched on olive branches and Wilson's words: "Peace must be planted upon the tested foundations of political liberty."

PHOTOS: WHITE HOUSE HISTORICAL ASSOCIATION

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ENDANGERED OCCUPATIONS

By Daniel Stone

The snake charmer. The yarn threader. The broommaker. Traditional jobs in India can be as varied and distinctive as the country's bright colors and rich flavors. That occupational diversity is on display in "Marginal Trades," photographer Supranav Dash's portrait series showcasing people at work, primarily in West Bengal and Uttar Pradesh.

The jobs Dash portrays—making sweets, for example, or cow-dung cakes for fuel—are vanishing, and with them goes a social hierarchy that's held for centuries. For many people in India, the caste system has long determined one's occupation. But now that public discrimination based on caste has been banned, Dash sees more young people ignoring caste-based limitations, including restrictions on what livelihoods they can pursue. "They just don't seem to care," says Dash, who grew up in Kolkata.

Many of the workers whose trades are waning—especially artisans—are at the mercy of economic as well as cultural forces. "The major threat to crafts and traditional jobs is technology," says Indian economist Shyam Sundar. Cups once made by hand can be mass-produced from plastic. Individual goldsmiths can't compete with newly built factories.

"What you hear a lot from artists and crafters is that they know their kids will not continue their work," says Sundar. "They say, 'My craft will end with me.' "

Rajeshwar Halder is a cotton-candy seller, also known as a *burir-chul wallah*, in West Bengal. He earns about $15 a week.

PHOTO: SUPRANAV DASH

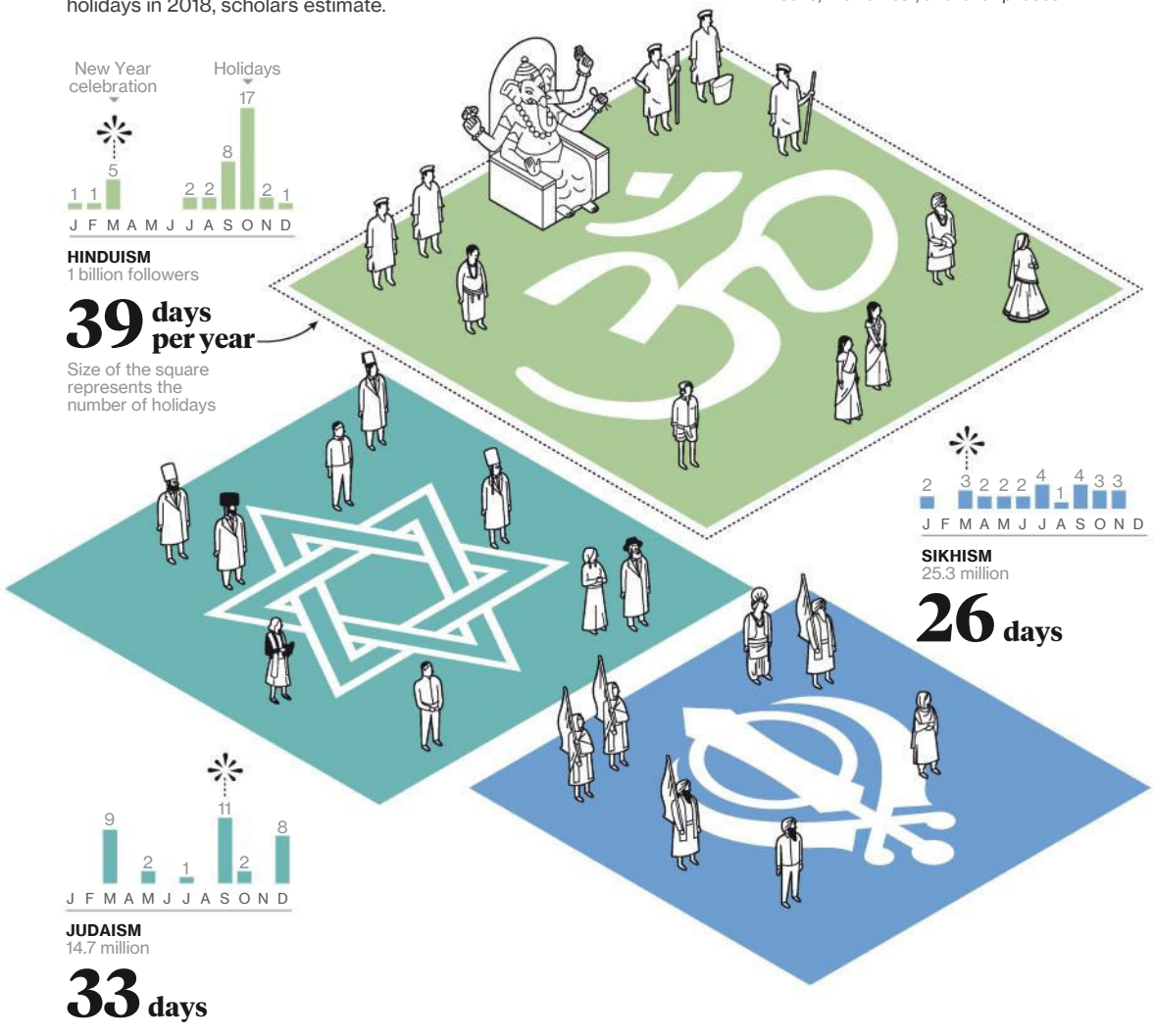

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Who Celebrates the Most?

With feasts, fasts, and prayers, the world's nine largest religions will collectively observe more than a hundred holidays in 2018, scholars estimate.

HINDUS LEAD THE FESTIVITIES

Hinduism recognizes the birthdays and milestones of hundreds of deities. It also commemorates the changing of the seasons, the harvest, and lunar phases.



THE HOLY DAYS

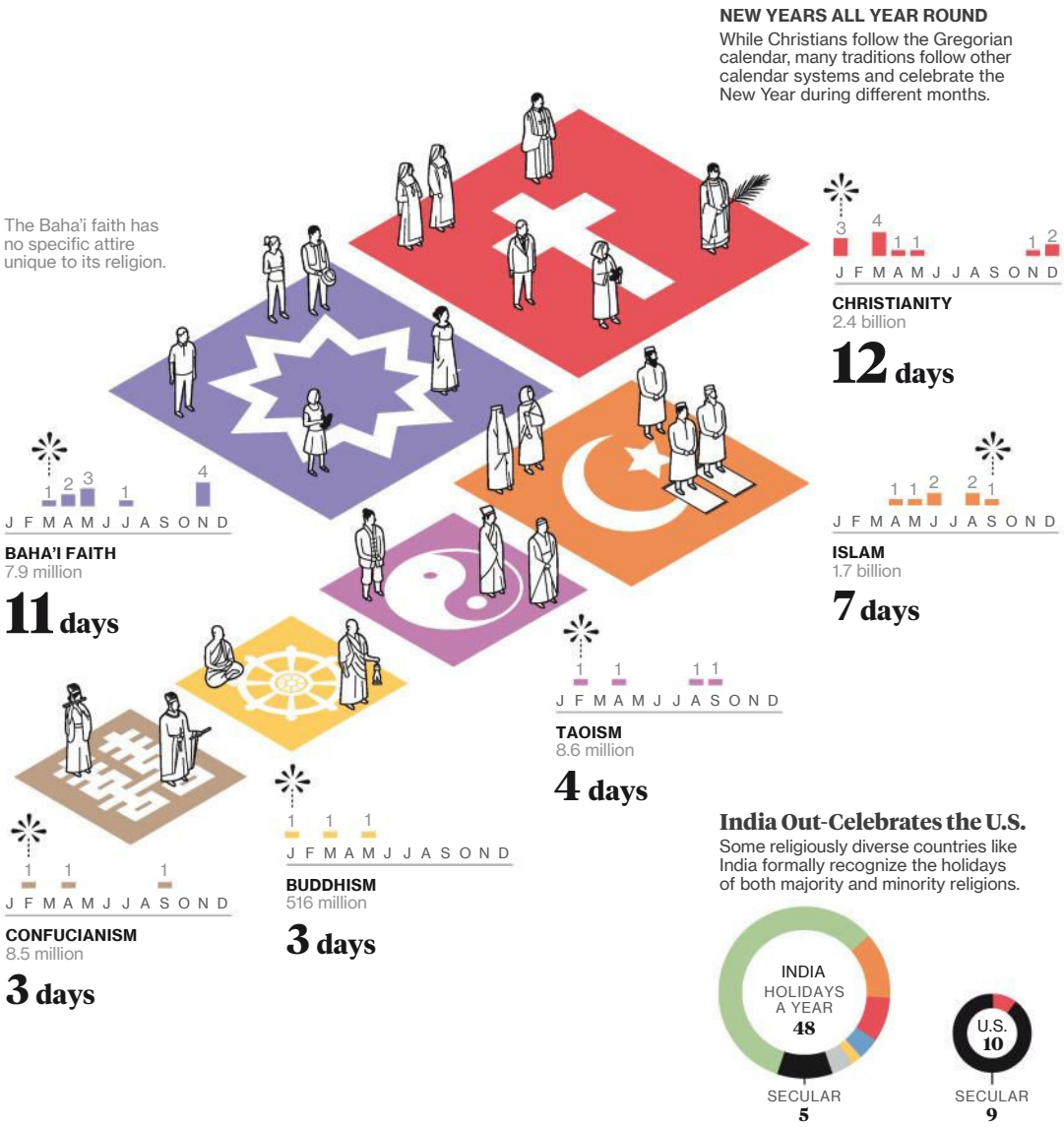
By Nina Strochlic

Somewhere in the world, a meal, ritual, or offering is being prepared in religious observance—most likely by the busy adherents of Roman Catholicism or Hinduism. If Catholics celebrated every saint's day or Hindus commemorated each deity's birthday, nearly the entire year would be accounted for.

The Jewish calendar has dozens of holidays—but the Torah only mandates strict observance of the holiest five. Muslims, too, are holiday minimalists. In Islam the biggest celebrations are saved for the last days of its two major holidays: Id al-Fitr for Ramadan, and Id al-Adha to end the hajj pilgrimage.

Compiling a schedule of the holidays most widely observed by the world's nine largest religions—as seen above—is no simple task. Different countries and regions, as well as denominations, celebrate their own versions of the holidays, and some religions follow a unique calendar. China's lunar calendar runs on a 60-year cycle; India uses several types of calendars.

MONICA SERRANO, NGM STAFF; KELSEY NOWAKOWSKI



"Every year different countries will have a political battle over adding or changing a holiday," says J. Gordon Melton, a professor of religion at Baylor University and author of the encyclopedic *Religious Celebrations*.

The establishment of the international date line in 1884 pushed holidays that used to begin at sunset to the next day in many countries. Today holiday scheduling can be influenced by things like economic productivity, which is the reason some celebrations move around each year to bookend a weekend.

The only religious federal holiday in the U.S. is Christmas, while other countries have a more inclusive approach to observance. In multi-theistic India, citizens can choose from a list of Christian, Muslim, Sikh, and Buddhist holidays, in addition to 28 recognized Hindu holidays, to take off. "In the modern mixed religious environment, having holidays recognized by the government is a step toward public acceptance for smaller religious groups," says Melton.

Estimates of followers as of 2015. Only days of observance widely celebrated across the religion or by most of its adherents are shown. All dates correspond to the solar calendar. Buddhist dates apply to holidays in most of East Asia; Tibet and Sri Lanka celebrate those holy days on different dates. In addition to its five main religions, India recognizes days for Jainism and Zoroastrianism.

SOURCES: J. GORDON MELTON, BAYLOR UNIVERSITY; PAUL MIRECKI, DANIEL STEVENSON, AND SAMUEL HAYIM BRODY, UNIVERSITY OF KANSAS; BRIAN COLLINS, OHIO UNIVERSITY; SIMRAN JEET SINGH, SIKH COALITION; GERALD FILSON AND CEDRIC GABER, BAHA'I COMMUNITY OF CANADA; JEFFREY RICHEY, BEREA COLLEGE; NATIONAL PORTAL OF INDIA; U.S. OFFICE OF PERSONNEL MANAGEMENT; WORLD RELIGION DATABASE



Clouds drift over taro fields within Hanalei National Wildlife Refuge on the Hawaiian island of Kauai.

REBIRTH OF A HALLOWED ROOT

By Catherine Zuckerman

Hawaiian legend holds that taro is the sacred ancestor of all Hawaiian people. The staple root crop is so valued that it's "known affectionately as the staff of life," says University of Hawaii agroecologist Noa Kekuewa Lincoln. Known locally as *kalo,* the plant has been fundamental to the Hawaiian diet and culture for centuries—but its future is uncertain.

Once one of the world's most cultivated root crops, taro has been succumbing to taro leaf blight, a disease caused by water mold. Many of Hawaii's traditional varieties are particularly susceptible, says agronomist Susan Miyasaka. Over the past 50 years, yields have dropped by more than half. Hoping to change that, Miyasaka and her team are testing blight-resistant taro at the University of Hawaii.

Irrigation has also been an issue. Abundant water is key for growing taro, but large agriculture operations, golf courses, and housing developments are diverting the precious resource. Now some water rights advocates are shifting the flow. Says farmer Hōkūao Pellegrino, who is restoring a traditional, terraced taro farm on his family's land on Maui: "People are surprised to see we even exist, because for almost two generations our stream was practically dry."



THE RECIPES THEY CARRIED

Refugees arrive in a new country with little more than memories. From afar, they re-create the flavors of a past life, like the Iraqi grape leaves at left. "Preparing these meals and sharing them with friends and family can have immeasurable psychological benefits," says Zaid Jalood, a community health officer with the International Medical Corps in Iraq. For 40-year-old Fatma, displaced by the war in Libya, it's the traditional pumpkin-and-potato stew her mother taught her to make. "*Bazeen* is not just a meal," she says. "It's a connection to my hometown." —*Nina Strochlic*

PHOTOS, FROM TOP: PETER ADAMS; LESLYE DAVIS, NEW YORK TIMES, REDUX

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DANCES STEP OUT OF THE PAST

By Gulnaz Khan

Though dance is one of the oldest languages on Earth, its cultural significance has at times gotten lost in translation. But around the globe some dances are now being revived—and others are getting a fresh spin in the spotlight.

In 2011, for example, Beyoncé showcased Eskista—a shoulder-shimmying Ethiopian dance—in the video for her hit song "Run the World (Girls)." And in parts of the United States, interest in square dancing is kicking up again after years of decline.

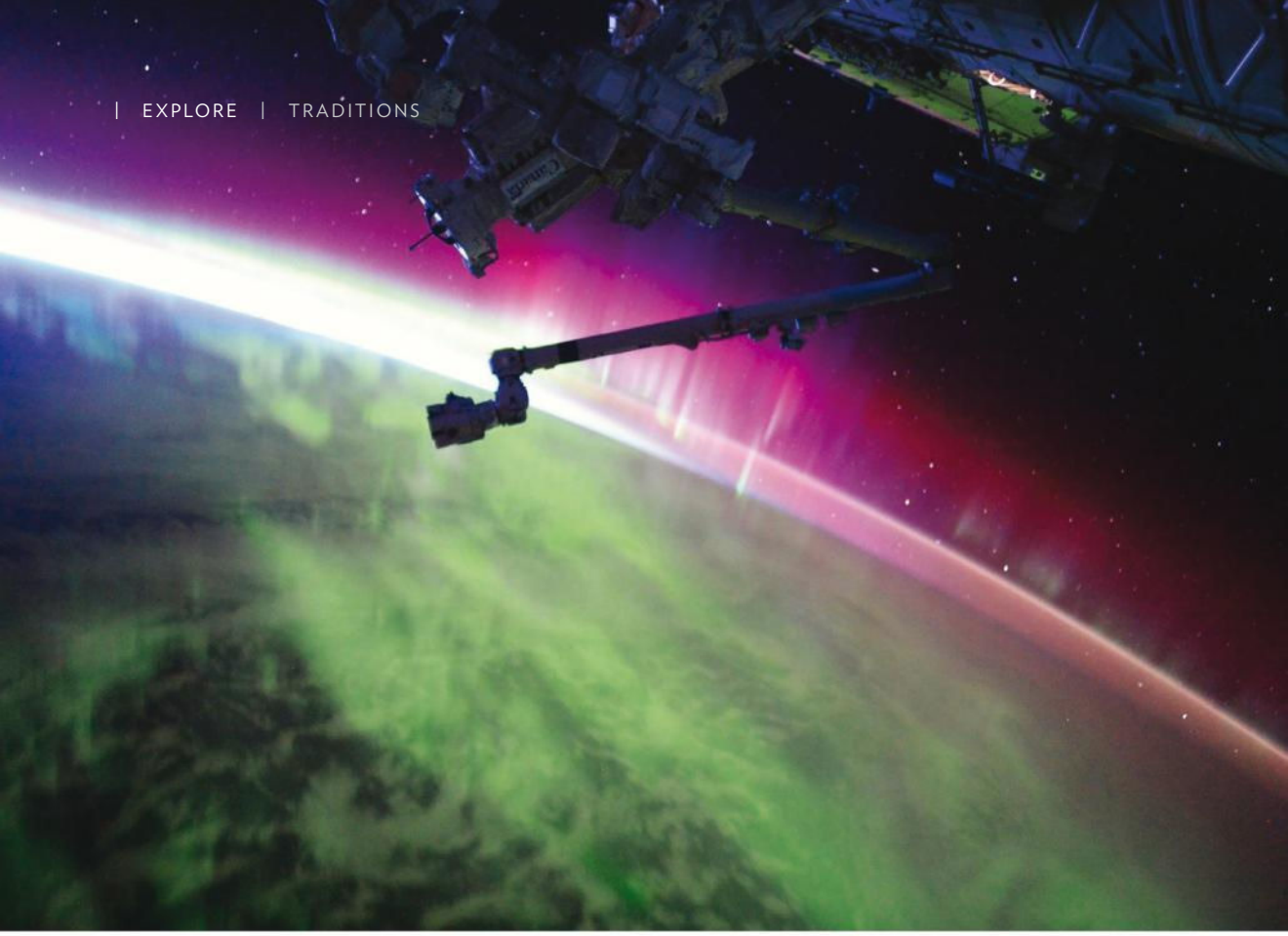
Some revivals bend gender. Women-only clubs are now a trend in morris dance, the 500-year-old English pastime that was once mostly male. And men in Turkey are performing as belly dancers, as they did in the Ottoman Empire.

Dance has made comebacks before. During the Renaissance, dancing in general regained popularity as the church's control of secular life waned. Even the waltz, now considered a classic, was once banned because it encouraged close physical contact between the sexes.

The *apsara* dance dates from Cambodia's medieval Angkorian civilization. The tradition nearly vanished in the 1970s when the Khmer Rouge regime selectively killed artists and intellectuals. But apsara performances have resumed recently, part of an effort to reclaim Cambodia's cultural heritage.

PHOTO: IMAGEBROKER


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HOLIDAYS IN SPACE

By Daniel Stone

Former astronaut Scott Kelly has spent every American holiday in space, except St. Patrick's Day. His last mission aboard the International Space Station kept him in orbit from late March 2015 to early March 2016 as part of a study on the biological effects on the human body of long durations in space, in anticipation of a mission to Mars. But he returned to Earth just shy of a full year. The mission was one of four stretches Kelly spent in orbit between 1999 and 2016.

Time passes at a strange rate in space. A "day" is hard to define when you're circling the entire world every 90 minutes. Most 24-hour periods look alike. "The days are pretty routine," says Kelly, a flight engineer and mission commander whose new book, *Endurance: A Year in Space, A Lifetime of Discovery,* recalls his 520 cumulative days spent in space. With nowhere to go and little time for genuine leisure, one's primary entertainment is often simply watching the Earth go by.

But crews break from the routine around big holidays—at least long enough to share some thoughts or a toast (of juice, from a pouch). On Thanksgiving in 2015, the Americans celebrated with turkey cold cuts. One year on Christmas Eve, Kelly tweeted a photo he'd taken of the Earth (above). Country-specific holidays, such as Columbus Day in the United States, tend to pass unnoticed. With crew from U.S., Russian, Italian, Japanese, and British space agencies present, there'd be too many to observe.

There is one exception, though. "New Year's Eve is a bigger holiday than Christmas on the space station, because it's celebrated by all nations on the same day," Kelly says. He remembers looking down and seeing fireworks on Earth, just tiny little specks of light.



'NEW YEAR'S EVE IS A BIGGER HOLIDAY THAN CHRISTMAS, BECAUSE IT'S CELEBRATED BY ALL NATIONS.'

SCOTT KELLY, ASTRONAUT

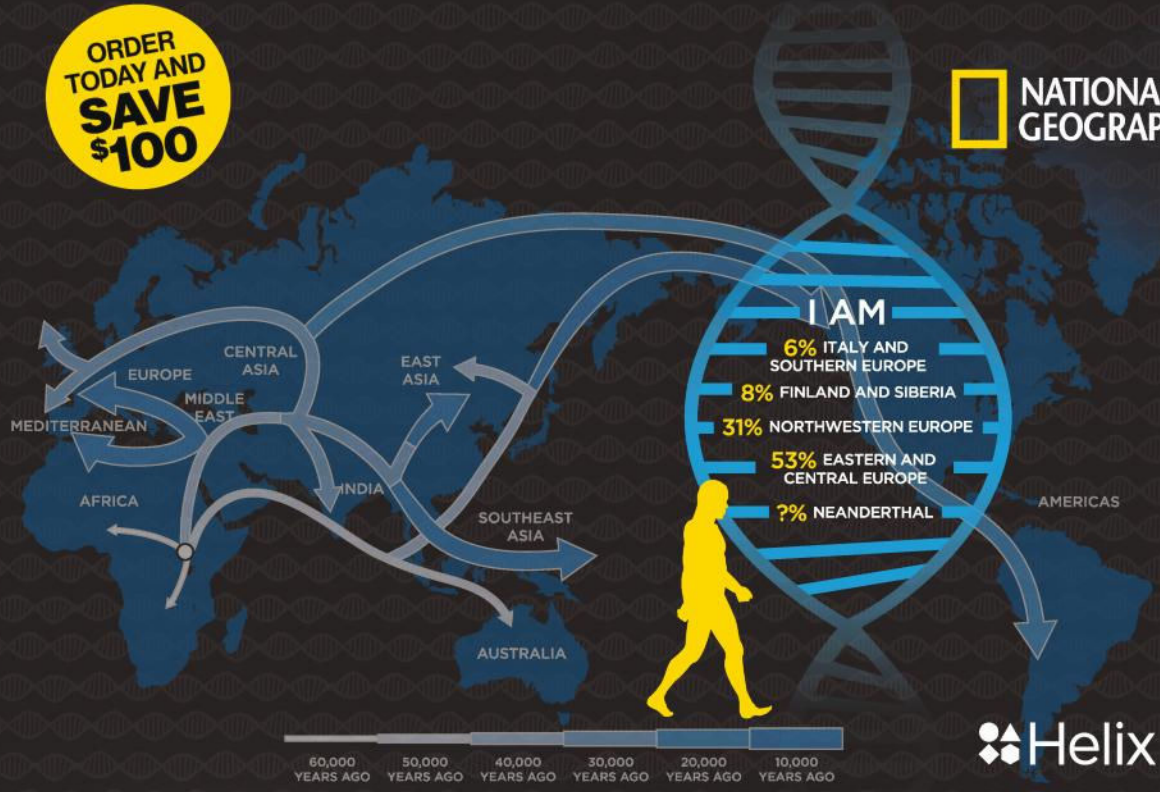
PHOTOS, FROM TOP: SCOTT KELLY, NASA; SCOTT KELLY

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‘THE BIGGEST STORY ON EARTH IS EARTH ITSELF.’

DAVID DOUBILET

Those who explore the planet come to cherish it, and those who cherish the planet want to protect it. In that spirit, National Geographic and Rolex have formed a new partnership to promote exploration and conservation. The organizations will join forces in efforts that support veteran explorers, nurture emerging explorers, and protect Earth’s wonders.

To learn more, read on.

Photographer and explorer David Doubilet has been an ambassador for Rolex since 1994 and has produced nearly 70 stories for *National Geographic*. Doubilet photographed this fjord wall covered with sea anemones in Bonne Bay, in Newfoundland’s Gros Morne National Park.

***NATIONAL GEOGRAPHIC* PRODUCED THIS EXPANDED VERSION OF FIELD NOTES AS PART OF A PARTNERSHIP WITH ROLEX.**

PHOTO: DAVID DOUBILET, NATIONAL GEOGRAPHIC CREATIVE

A PARTNERSHIP TO ADVANCE EXPLORATION

'The Pole at last!' That note in Robert Peary's diary proclaimed his team's discovery of the North Pole, on a 1909 expedition sponsored by the National Geographic Society.

On May 29, 1953, Edmund Hillary and Tenzing Norgay became the first climbers to summit Mount Everest, as part of an expedition team sponsored and equipped by Rolex.

Together National Geographic and Rolex have more than 200 years of experience supporting expeditions and explorers. Now they're building on that legacy with a unique partnership.

As both did in the 20th century, Rolex and National Geographic will continue to support the pioneers who explore uncharted realms. But now the partnership will also undertake a broader mission. Along with exploring Earth's wonders, it will seek to deepen people's scientific understanding of those wonders—and their commitment to protecting them.

The partners will support conservation and exploration efforts around three critical areas: Earth's oceans, its poles, and its mountains. In each area Rolex and National Geographic will

- Enable and join expeditions led by inspiring scientists and storytellers;
- Support research that could lead to scientific discovery, new technologies, and innovative solutions;
- Convene summits and activities that inform and educate the public.





The work on oceans is already under way. At *nationalgeographic.com,* we're publishing new content inspired by our partnership, including ocean-related photography, articles, graphics, and reference materials. The website will be regularly replenished with new coverage, which will also be shared via social media channels. In time it likely will offer videos and virtual reality experiences, television programs, films, and more.

Both partners have long had alliances with leading figures in ocean exploration. Among them: oceanographer Sylvia Earle, who has worked with Rolex since 1970; oceanographer Don Walsh, who in 1960 reached the deepest part of the ocean in a bathyscaph; filmmaker James Cameron, who in 2012 piloted a one-person submersible to the same historic ocean depths; and underwater photographer Brian Skerry, the Rolex National Geographic Explorer of the Year for 2017.

Together Rolex and National Geographic are committed to inspiring and assisting new generations of explorers. The men and women on the next six pages typify the passion and ambition at the heart of this partnership. It's our pleasure to share their stories. *—The Editors*

Two of the 20th century's most historic feats of exploration were the first summiting of Mount Everest, by Edmund Hillary and Tenzing Norgay (above, left to right), seen here during their ascent; and the discovery of the North Pole. Robert Peary, who led the polar expedition, took the photo below in the vicinity of the North Pole. It shows one of several flags planted by his team, which included Inuits Ooqueah, Ootah, Egingwah, and Seegloo, and Peary's fellow American, Matthew Henson.

Contributing: Eve Conant, Daniel Stone, Nina Strochlic, and Catherine Zuckerman

PHOTOS, FROM TOP: ALFRED GREGORY, ROYAL GEOGRAPHICAL SOCIETY (WITH IBG); ROBERT E. PEARY, NATIONAL GEOGRAPHIC CREATIVE

20,000 LEAGUES OVER THE SEA

Ghislain Bardout

Ghislain Bardout and his wife, Emmanuelle Périé-Bardout, have explored under the Arctic ice cap, with support from Rolex. Now they're on a three-year mission to cross every latitude, from the high Arctic to the shores of Antarctica. Along the 50,000-mile journey, they'll dive in some of the planet's most remote waters, to depths rarely reached by humans.

The couple and their team plan to explore ecosystems in the ocean's twilight zone, a realm that most light never reaches. They're also building an underwater "capsule" that would allow divers to stay underwater for a few days.

Their last stop this year was in Alaska, where they moored for the winter; in March they'll head for Polynesia. Along for the ride: their sons, ages five and one.



Off the coast of Greenland, on a February day with only minutes of sunlight, Ghislain Bardout plays with his son Robin and dog, Kayak, on the sea ice.

CRUSADING FOR AT-RISK SHARKS

Jessica Cramp

The Cook Islands are a long way from the San Diego drug discovery lab where Jessica Cramp once worked. Eager to put her training to more tangible use, she traded her day job for a life helping protect sharks—animals she has said sparked her interest in ocean issues.

A childhood fan of Jacques Cousteau, Cramp moved to Rarotonga Island in the South Pacific's Cook Islands, where she successfully campaigned to ban the commercial shark trade throughout the Cook Islands and helped designate a 772,204-square-mile shark sanctuary.

Since then Cramp has founded a research, outreach, and advocacy organization called Sharks Pacific. Via her computer, she uses satellites to track the movements of tagged migratory sharks and studies how to best design policies to protect the threatened creatures. "I'm interested in finding the right balance between sharks, fish, and people—because people have to be considered as a part of the ecosystem," she says. By drawing these connections, she plans to continue to "mainstream the ocean."



"My research depends on technology," says Jessica Cramp, who uses satellite tags to track shark movement. Each time a shark's fin breaks the water's surface, its location is transmitted to her computer via satellite.

PHOTOS, FROM TOP: LUCAS SANTUCCI, UTP/ZEPPELIN; DAVE MCALONEY, NATIONAL GEOGRAPHIC CREATIVE

CHARTING MARKS ON SEA GIANTS

Brad Norman

The whale shark is one of the ocean's most mysterious animals, but Australian marine biologist Brad Norman has been slowly unraveling its secrets for nearly a quarter century.

The constellation-like patterns on each whale shark are as unique as a human fingerprint. With that in mind, Norman helped specialists rejigger an astronomical algorithm into a search tool that scans photos to identify individual sharks—vital knowledge for large-scale tracking and conservation.

He's also mustered an army of citizen scientists, including kids. Inspiring others "to help save the biggest fish in the sea, and the natural environment it relies on, is a joy and a privilege," he says.

Norman, a Rolex Awards for Enterprise laureate, worked to get whale sharks listed as endangered and says he's now trying to solve some of the biggest mysteries in their movements: "We're embarking on an ambitious program to hopefully uncover the 'holy grail': Where do whale sharks go to breed?" Stay tuned.



Brad Norman studies a whale shark in Australia's Ningaloo Marine Park. Known as gentle giants, the sharks can reach 60 feet long.

THE ANIMAL EMPATHIZER

David Gruber

"I try to see the ocean through the eyes of sea creatures," says marine biologist David Gruber. That inquisitive attitude is what drove the National Geographic emerging explorer to build an underwater camera that simulates the vantage point of a turtle. Gruber and his team began working on the camera in 2015, after his groundbreaking discovery of a biofluorescent hawksbill sea turtle in the Solomon Islands.

Gruber also helped create something he calls a "squishy robot hand." Made mostly of silicone rubber with "fingers" that can grab and curl, the tool allows him to collect and study samples of delicate sea coral without damaging them. He expects to develop other soft robots to further his research on jellyfish.

Over the next few months, visitors to the National Geographic Ocean Odyssey exhibit in New York City will get to see Gruber's latest work—on flashlight fish in the South Pacific and how they communicate with each other. It's all part of his larger vision, he says, of "exploration that raises empathy."



Marine biologist David Gruber scuba dives off Little Cayman in the Caribbean's Cayman Islands.

PHOTOS, FROM TOP: KURT AMSLER, ROLEX AWARDS FOR ENTERPRISE; JIM HELLEMN

DEMOCRATIZING OCEAN SCIENCE

Shah Selbe

"There has never been a more exciting time for conservation technology," says Shah Selbe. Last year the former rocket scientist founded Conservify, a lab that focuses on using open-source technologies—satellite data, sensors, drones, and apps—to better equip citizen scientists.

The company is currently creating low-cost GPS trackers that can be hidden among shark fins to track the illegal trade. Another project: developing a long-distance system that uses drones to monitor marine-protected areas.

The lab has recently produced a drone that, as Selbe explains, takes "a real-time acoustic image of the area around it, like a bat, and can fly in tight spaces, such as caves." It's not rocket science—but it's just as impressive.



Shah Selbe (at left) and assistant Aaron Grimes use a balloon rigged with a camera to map California's coastline.

DEEP-SEA SOUND CHECK

Michel André

The ocean is never as silent as it seems. Natural noises from creatures, storms, and earthquakes, plus sound from thousands of ships as well as underwater drilling and dredging, can make quite a racket. For animals like whales and dolphins that use sound to navigate, the cacophony blunts that ability and can cause long-term physiological effects.

A bioacoustician and a Rolex laureate, Michel André studies the sound of the oceans along shipping lanes, in popular ports, and in remote parts of the planet. "For several decades," he says, "we've known that the effects of artificial noise produced by human activities are affecting the whole food chain."

André's goal isn't to eliminate the noise but to find ways to reduce its damage. His team developed a system called LIDO—Listening to the Deep Ocean Environment—to collect sound data from 22 underwater observatories and then compare it with migration patterns. Knowing where the animals are can allow ships to alter their course just enough to make a difference.



Based in Spain, Michel André oversees a project that monitors ocean noise. Its data inform policymakers on how to reduce noise impact on marine life.

PHOTOS, FROM TOP: SHAH SELBE; JOSEP MARIA ROVIROSA

DIVING DEEP IN CHILE'S FJORDS

Vreni Häussermann



Fish farming and pollution are among the threats to the plant and animal species that live in the marine areas of Chile's Patagonia.

Chile's Patagonia—with its mountains, islands, and fjords—is one of the world's wildest places. But the rugged region is undergoing a frightening transformation, according to biologist Vreni Häussermann, who began studying its marine life in 1997.

In Chile's fjords, coral banks are dying, the waters are muddied by boats and trash, and fish have been farmed en masse. The pollution is so bad that it's causing mass die-offs: In 2015 Häussermann and colleagues discovered 337 dead whales.

Häussermann hopes that documenting the underwater life of the fjords will help save them. Previously, the Rolex laureate's research took her only 100 feet underwater, but now she's preparing to explore 1,600 feet below the fjords' surface with the help of a remote-operated submarine. The project will upload photos and videos to Google Earth and YouTube to "show the beauty of Chilean Patagonia to the Chilean public and decision-makers," Häussermann says.

She hopes the images will fuel efforts to declare the region a protected area before it's too late to reverse the damage. But first, she says, access to the fjords should be limited "because we do not know how to sustainably use the region."

SWIMMING WITH THE SUNFISH

Tierney Thys



"When you love what you're doing, it doesn't seem like work at all," says Tierney Thys, posing with a giant sunfish in the waters off San Diego.

Tierney Thys has loved the ocean since she was a child growing up in California. Nowadays the marine biologist can often be found off the shores of the Galápagos, studying giant ocean sunfish as part of a larger effort to protect the region's megafauna.

Her underwater explorations have revealed a bay where she says the sunfish have established "year-round residency" and a "cleaning station" some 260 feet deep where smaller fish scour the giants of their parasites.

Among multiple other projects, Thys is also training female Ecuadoran scientists in marine biotelemetry—the use of ultrasonic devices to detect and record movements of marine animals like whale sharks and turtles. Given the gender gap in the sciences, "training women scientists is of particular importance," she says. "We need more female role models to show the possibilities that exist for young girls to embrace science as an exciting, critical, innovative, problem-solving, and life-sustaining career option."

PHOTOS, FROM TOP: VRENI HÄUSSERMANN; MIKE JOHNSON

HIS ROBOTS RAISE AWARENESS

David Lang

"We're trying to empower citizen scientists to take a larger role in protecting their oceans," says National Geographic Emerging Explorer David Lang. To do that, he's offering people a powerful tool: robots.

Lang is the co-founder of OpenROV, which promotes deep-sea discovery using remotely operated vehicles. Over the course of the next year, the company will support citizen scientists, conservation organizations, and classrooms and supply drones for certain projects.

Each drone will be assigned a specific mission, from monitoring changes in marine species off the coast of California to scanning the Mediterranean Sea for shipwrecks and other signs of ancient life.



Once deployed, the underwater robots will allow people to explore the seas from dry land—and gain a deeper understanding of what needs to be protected, and why.

David Lang hopes his drones, like this one in Monterey, California, will help land dwellers better understand the ocean.

ON THE TURTLE TRAIL

Mariana Fuentes

Hoisting hundred-plus-pound sea turtles up from the water and onto a boat is no easy task. But that's what marine conservation biologist Mariana Fuentes does to help save the endangered reptiles.

Sea turtles live in warm waters across the globe. Fuentes's current focus is the Bahamas, whose government has pledged to set aside 20 percent of its marine environment as a protected area.

Turtles weren't Fuentes's first love. "At first I wanted to work with manta rays," she says, recalling a close encounter she had with one that had mistaken her for food. Then, while interning in Brazil—her native country—Fuentes became drawn to sea turtles, which can live for a century. "The fact that they are survivors," she says, "made me want to conserve them."



After gently catching a sea turtle, Mariana Fuentes takes samples, then tags and releases it. Tagging allows her to map habitat and distribution.

PHOTOS, FROM TOP: PATRICK WEBSTER, NATIONAL GEOGRAPHIC CREATIVE; MATTHEW WARE

A WATCHDOG FOR THE WHALES

Asha de Vos

Asha de Vos's superpower is action. Conservation of Sri Lanka's blue whales was almost nonexistent when she started researching them. Today her videos and campaigns reach thousands of followers—all the way up to the government.

In 2003 de Vos began hitching rides on fishing and research vessels. She discovered that the whales were not migrating to food-rich areas and some were being hit by vessels traveling in shipping lanes.

As the first Sri Lankan to get a Ph.D. in marine mammal research, de Vos drew media attention to the issue, inspiring government intervention. This year she launched Oceanswell, Sri Lanka's first organization focused solely on marine conservation research and education.



"We have the challenge," Asha de Vos says of this moment in marine conservation. "But we may not always have the opportunity [to tackle it]."

AT HOME, UNDERWATER

Grace Young

Grace Young once lived under the sea, spending 15 days in a 66-foot-deep research habitat off the Florida Keys. Eagle rays swam by her window. Groupers made eye contact. Being an aquanaut, she says, was a bit like being an astronaut, living in an alien world.

Young, a National Geographic emerging explorer, has focused her research on coral reefs: where they are, how they grow, and what's happening to them. Looking at a healthy coral reef is like looking at a small city. There are apartments for fish, food grows nearby, and organisms as small as a millimeter or as long as a meter live in cramped spaces together. Understanding how they work is crucial to knowing how to protect them.



Young dives in the ecosystems she studies, but truly deciphering a reef requires more than simply seeing it up close. She's devising underwater imaging systems that detect measures that eyes can't, like nutrient flow, water temperature, and sound dynamics. "Many, if not most, marine animals see not with their eyes but with their ears," she says. "We want to understand the reef from that perspective as well."

Grace Young researches how coral reefs are changing. She helps design artificial reefs that can be sunk to restore some ecosystems.

PHOTOS, FROM TOP: RANDALL SCOTT, NATIONAL GEOGRAPHIC CREATIVE; BRIAN HALL, MISSION 31



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SPIRIT BEAR

HABITAT/RANGE
Islands and coast of the Great Bear Rainforest in British Columbia

CONSERVATION STATUS
It's among Earth's rarest bears, with an estimated population of a few hundred.

OTHER FACTS
The name *Ursus americanus kermodei* honors Francis Kermode, one of the first people to identify the subspecies.

WHY THIS BLACK BEAR IS WHITE

By Patricia Edmonds

For millennia the Kitasoo native people on Canada's Pacific coast have known this bear and its legend. As the elders tell it, Raven the Creator had turned Earth from a frozen rock into a green garden. But as a reminder of the ice age, he caused every 10th black bear to be white. The formal name is Kermode bear. Locals call them ghost, or spirit, bears, and some believe they're sacred or supernatural creatures.

There is science, not just folklore, behind several of the spirit bear's traits.

By genus and species, it's an American black bear. But if both parents (no matter their color) have the same mutation in a gene that affects pigment production, their offspring will have white fur. To confirm this, researchers used wire snares to collect samples of bears' hair, then analyzed the DNA. Of 220 bears, 22 had inherited the recessive white-coat gene from both parents—and all 22 were white.

Mating season lasts from May through July. As in all bear species, fertilized embryos delay implantation in the female's uterus. If a sow isn't vigorous enough to sustain a pregnancy, embryos won't implant and she'll bear no cubs that year. But if she's healthy and strong, the embryos will implant in the fall and a one- to five-cub litter will be born that winter.

In this matter the spirit bear uses its white magic. To store fat for winter, the bears spend fall days gorging on salmon. According to a 2009 study, during daylight the fish are twice as likely to evade the grasp of a black predator as a white one, faint as a ghost against the pale sky.

PHOTO: PAUL NICKLEN, NATIONAL GEOGRAPHIC CREATIVE


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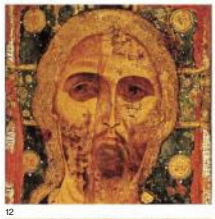

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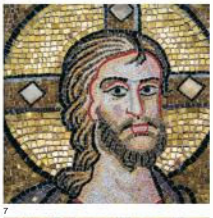
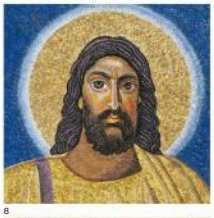
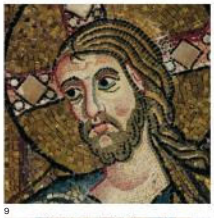

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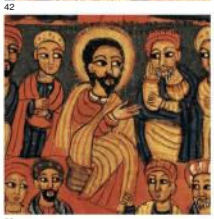






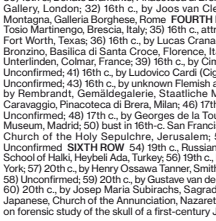


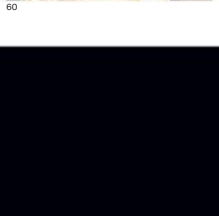










Portrayals of Jesus range from Roman-era frescoes to a modern forensic reconstruction. From top left: 1) 3rd-century fresco shows Mary, infant Jesus, and a prophet, catacombs, Rome; 2) 4th-5th c., catacombs, Rome; 3) 5th c., Mausoleum of Galla Placidia, Ravenna, Italy; 4) 6th c., St. Catherine's Monastery, Sinai Peninsula, Egypt; 5) 8th-9th c., Castelseprio, Italy; 6) 13th c., Sutri, Italy; 7) 12th c., Church of the Nativity, Bethlehem; 8) 6th c., Church of Saints Cosmas and Damian, Rome; 9) 12th c., Church of the Nativity, Bethlehem; 10) 14th c., by Giotto, Vatican Museums; 11) 13th-14th c., Matera, Italy **SECOND ROW** 12) 13th c., Moscow; 13) 13th c., by Pietro Cavallini, Basilica of St. Cecilia, Rome; 14) Unconfirmed; 15) 14th-15th c., by Claus Sluter, Musée Archéologique, Dijon, France; 16) 15th c., by Petrus Christus, Metropolitan Museum of Art, New York; 17) 15th c., by Piero della Francesca, Museo Civico di Sansepolcro, Sansepolcro, Italy; 18) 15th c., attributed to Antonio della Corna, Walters Art Museum, Baltimore, Maryland; 19) 15th c., by Andrei Rublev, Tretyakov Gallery, Moscow; 20) 14th c., Museu Episcopal de Vic, Barcelona, Spain; 21) 15th c., by Hans Memling, Palazzo Bianco, Genoa, Italy; 22) 15th c., detail from Leonardo da Vinci's "Last Supper," Santa Maria delle Grazie, Milan **THIRD ROW** 23) Unconfirmed; 24) 15th c., attributed to Leonardo da Vinci, private collection; 25) 15th c., by Andrea del Verrocchio and Leonardo da Vinci, Uffizi Gallery, Florence, Italy; 26) 15th-16th c., after Fra Bartolommeo, British Museum, London; 27) 15th c., Museum of Macedonia, Skopje, Macedonia; 28) 15th c., by Alvise Vivarini, Pinacoteca di Brera, Milan; 29) 16th c., by Andrea Previtali, Pinacoteca di Brera, Milan; 30) 15th c., Donato Bramante, Pinacoteca di Brera, Milan; 31) 16th c., by Benedetto Diana, National Gallery, London; 32) 16th c., by Joos van Cleve, Louvre, Paris; 33) 16th c., by Bartolomeo Montagna, Galleria Borghese, Rome **FOURTH ROW** 34) 16th c., by Raphael, Pinacoteca Civica Tosio Martinengo, Brescia, Italy; 35) 16th c., attributed to Tullio Lombardo, Kimbell Art Museum, Fort Worth, Texas; 36) 16th c., by Lucas Cranach the Elder, private collection; 37) 16th c., by Il Bronzino, Basilica di Santa Croce, Florence, Italy; 38) 16th c., by Matthias Grünewald, Musée Unterlinden, Colmar, France; 39) 16th c., by Cima da Conegliano, National Gallery, London; 40) Unconfirmed; 41) 16th c., by Ludovico Cardi (Cigoli), Metropolitan Museum of Art, New York; 42) Unconfirmed; 43) 16th c., by unknown Flemish artist, Museum of Fine Arts, Houston; 44) 17th c., by Rembrandt, Gemäldegalerie, Staatliche Museen zu Berlin **FIFTH ROW** 45) 17th c., by Caravaggio, Pinacoteca di Brera, Milan; 46) 17th c., by Rembrandt, Alte Pinakothek, Munich; 47) Unconfirmed; 48) 17th c., by Georges de la Tour, Louvre, Paris; 49) 17th c., by El Greco, Prado Museum, Madrid; 50) bust in 16th-c. San Francisco Church, Santiago, Chile; 51) Byzantine style, Church of the Holy Sepulchre, Jerusalem; 52) ivory netsuke, Musée Guimet, Paris; 53) Unconfirmed **SIXTH ROW** 54) 19th c., Russian, British Museum, London; 55) Holy Theological School of Halki, Heybeli Ada, Turkey; 56) 19th c., by Heinrich Hofmann, the Riverside Church, New York; 57) 20th c., by Henry Ossawa Tanner, Smithsonian American Art Museum, Washington, D.C.; 58) Unconfirmed; 59) 20th c., by Gustave van de Woestyne, Museum of Fine Arts Ghent, Belgium; 60) 20th c., by Josep Maria Subirachs, Sagrada Familia church, Barcelona, Spain; 61) 20th c., Japanese, Church of the Annunciation, Nazareth; 62) 21st c., computer-generated image based on forensic study of the skull of a first-century Jewish man, devised by Richard Neave

THE SEARCH for the REAL JESUS

Believers revere him as the Son of God. Skeptics dismiss him as legend. Artists have cast him in images that reflect their own time and place. Today, archaeologists digging in the Holy Land are helping to sift fact from fiction.





Worshippers in Jerusalem's Church of the Holy Sepulchre surround the restored Edicule, a shrine that Christian tradition says was built over the burial place of Jesus Christ. The shrine attracted global attention in 2016 when restorers uncovered remnants of an ancient tomb behind its ornate walls.



In Jerusalem, Jesus healed a paralyzed man at a ritual pool surrounded by five colonnades called the Pool of Bethesda, reports the Gospel of John. Many scholars doubted that the place existed until archaeologists discovered clear traces of it beneath the ruins of these centuries-old churches.







Rising from her baptism in the Jordan River, an Indonesian Christian wears a gown depicting Jesus undergoing the same rite in the same river 2,000 years ago. The faith that began as a tiny Jewish sect is now the world's largest, most diverse religion, with more than two billion believers.

PHOTOGRAPHED WITH PERMISSION OF YARDENIT

By
KRISTIN ROMEY
Photographs by
SIMON NORFOLK



The office of Eugenio Alliata in Jerusalem looks like the home base of any archaeologist who'd rather be in the field dirtying his hands than indoors tidying things up. A tumble of dusty, defunct computer equipment sits in one corner, and excavation reports share crowded shelves with measuring reels and other tools of the trade. It feels like the office of every archaeologist I've met in the Middle East, except that Alliata is wearing the chocolate brown habit of a Franciscan friar and his headquarters are in the Monastery of the Flagellation. According to church tradition, the monastery marks the spot where Jesus Christ, condemned to death, was scourged by Roman soldiers and crowned with thorns.

"Tradition" is a word you hear a lot in this corner of the world, where throngs of tourists and pilgrims are drawn to dozens of sites that, according to tradition, are touchstones of the life of Christ—from his birthplace in Bethlehem to his burial place in Jerusalem.

For an archaeologist turned journalist like me, ever mindful that entire cultures rose and fell and left few traces of their time on Earth, searching an ancient landscape for shards of a single life feels like a fool's errand, like chasing a ghost. And when that ghost is none other than Jesus Christ, believed by more than two billion of the world's people to be the very Son of God, well, the assignment tempts one to seek divine guidance.

Which is why, in my repeated visits to Jerusalem, I keep coming back to the Monastery of the Flagellation, where Father Alliata always welcomes me and my questions with bemused patience. As a professor of Christian archaeology and director of the Studium Biblicum Franciscanum's museum, he's part of a 700-year-old Franciscan mission to look after and protect ancient religious sites in the Holy Land—and, since the 19th century, to excavate them according to scientific principles.



A bejeweled icon, or encolpion, worn by Theophilos III, Greek Orthodox patriarch of Jerusalem and all Palestine, venerates the Virgin Mary and the Christ Child.

As a man of faith, Father Alliata seems at peace with what archaeology can—and cannot—reveal about Christianity's central figure. "It will be something rare, strange, to have archaeological proof for [a specific person] 2,000 years ago," he concedes, leaning back in his chair and folding his arms over his vestments. "But you can't say Jesus doesn't have a trace in history."

By far the most important—and possibly most debated—of those traces are the texts of the New Testament, especially the first four books: the Gospels of Matthew, Mark, Luke, and John. But how do those ancient texts, written in the second half of the first century, and the traditions they inspired, relate to the work of an archaeologist?

"Tradition gives more life to archaeology, and archaeology gives more life to tradition," Father Alliata replies. "Sometimes they go together well, sometimes not," he pauses, offering a small smile, "which is more interesting."

AND SO WITH FATHER ALLIATA'S BLESSING, I set out to walk in the footsteps of Jesus, retracing his story as told by the Gospel writers and interpreted by generations of scholars. Along the way I hope to discover how Christian texts and traditions stack up against the discoveries of archaeologists who began sifting the sands of the Holy Land in earnest some 150 years ago.

But before I begin my pilgrimage, I need to probe an explosive question that lurks in the shadows of historical Jesus studies: Might it be



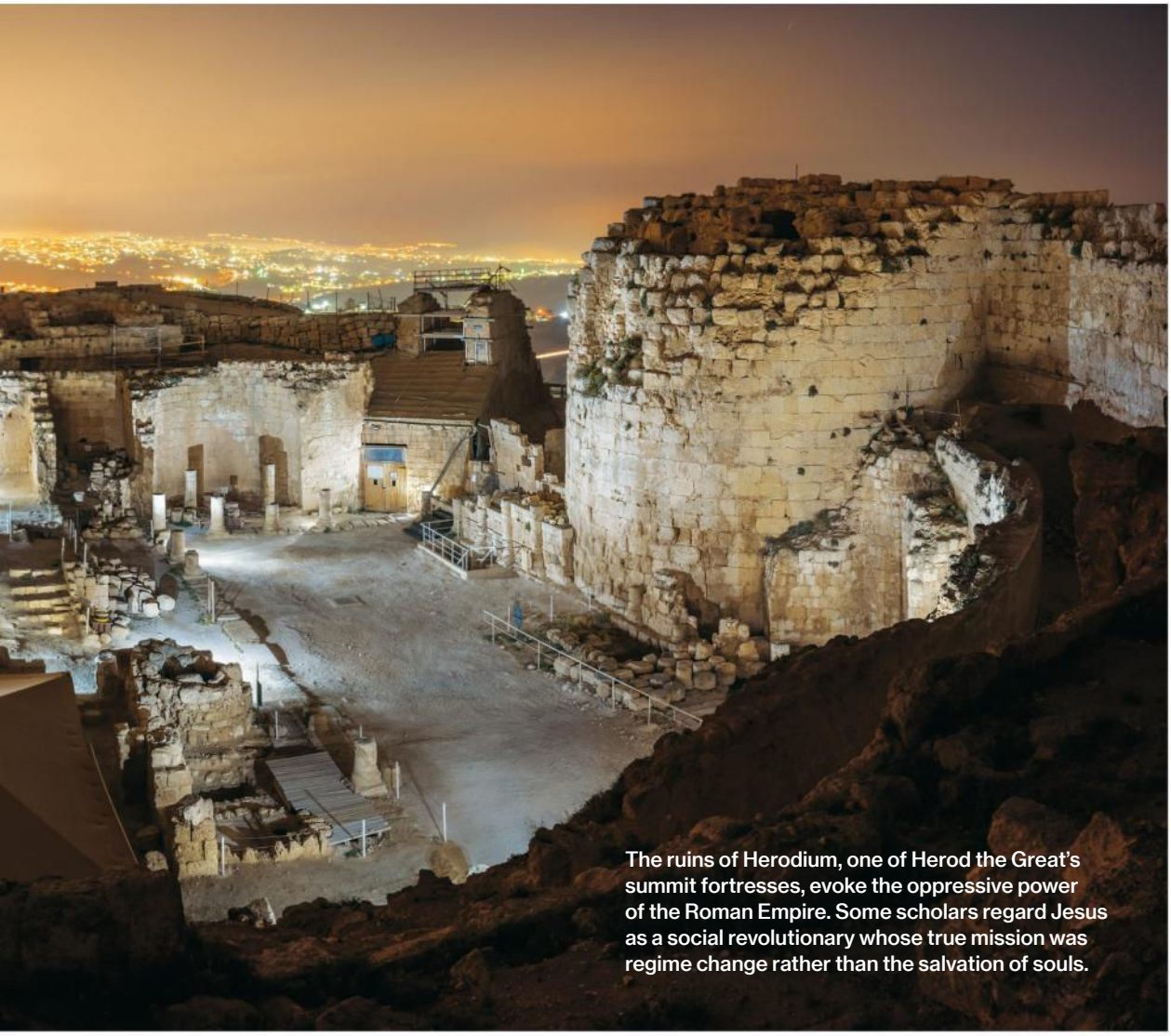
possible that Jesus Christ never even existed, that the whole stained glass story is pure invention? It's an assertion that's championed by some outspoken skeptics—but not, I discovered, by scholars, particularly archaeologists, whose work tends to bring flights of fancy down to literal earth.

"I don't know any mainstream scholar who doubts the historicity of Jesus," said Eric Meyers, an archaeologist and emeritus professor in Judaic studies at Duke University. "The details have been debated for centuries, but no one who is serious doubts that he's a historical figure."

I heard much the same from Byron McCane, an archaeologist and history professor at Florida Atlantic University. "I can think of no other example who fits into their time and place so well but people say doesn't exist," he said.

Even John Dominic Crossan, a former priest and co-chair of the Jesus Seminar, a controversial scholarly forum, believes the radical skeptics go too far. Granted, stories of Christ's miraculous deeds—healing the sick with his words, feeding a multitude with a few morsels of bread and fish, even restoring life to a corpse four days dead—are hard for modern minds to embrace. But that's no reason to conclude that Jesus of Nazareth was a religious fable.

"Now, you can say he walks on water and nobody can do that, so therefore he doesn't exist. Well, that's something else," Crossan told me when we spoke by phone. "The general fact that he did certain things in Galilee, that he did certain things in Jerusalem, that he got himself executed—all of that, I think, fits perfectly into a certain scenario."



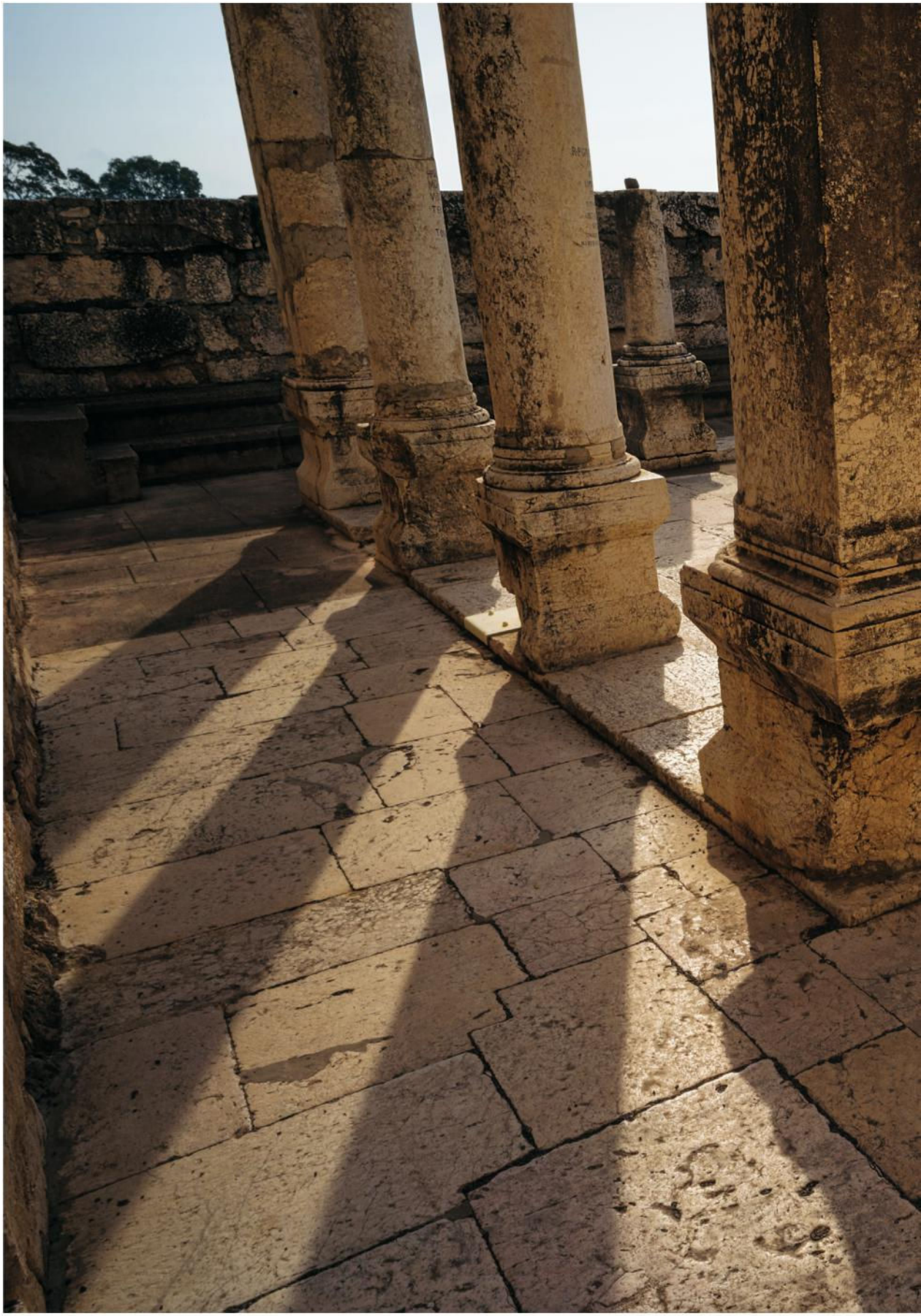
The ruins of Herodium, one of Herod the Great's summit fortresses, evoke the oppressive power of the Roman Empire. Some scholars regard Jesus as a social revolutionary whose true mission was regime change rather than the salvation of souls.

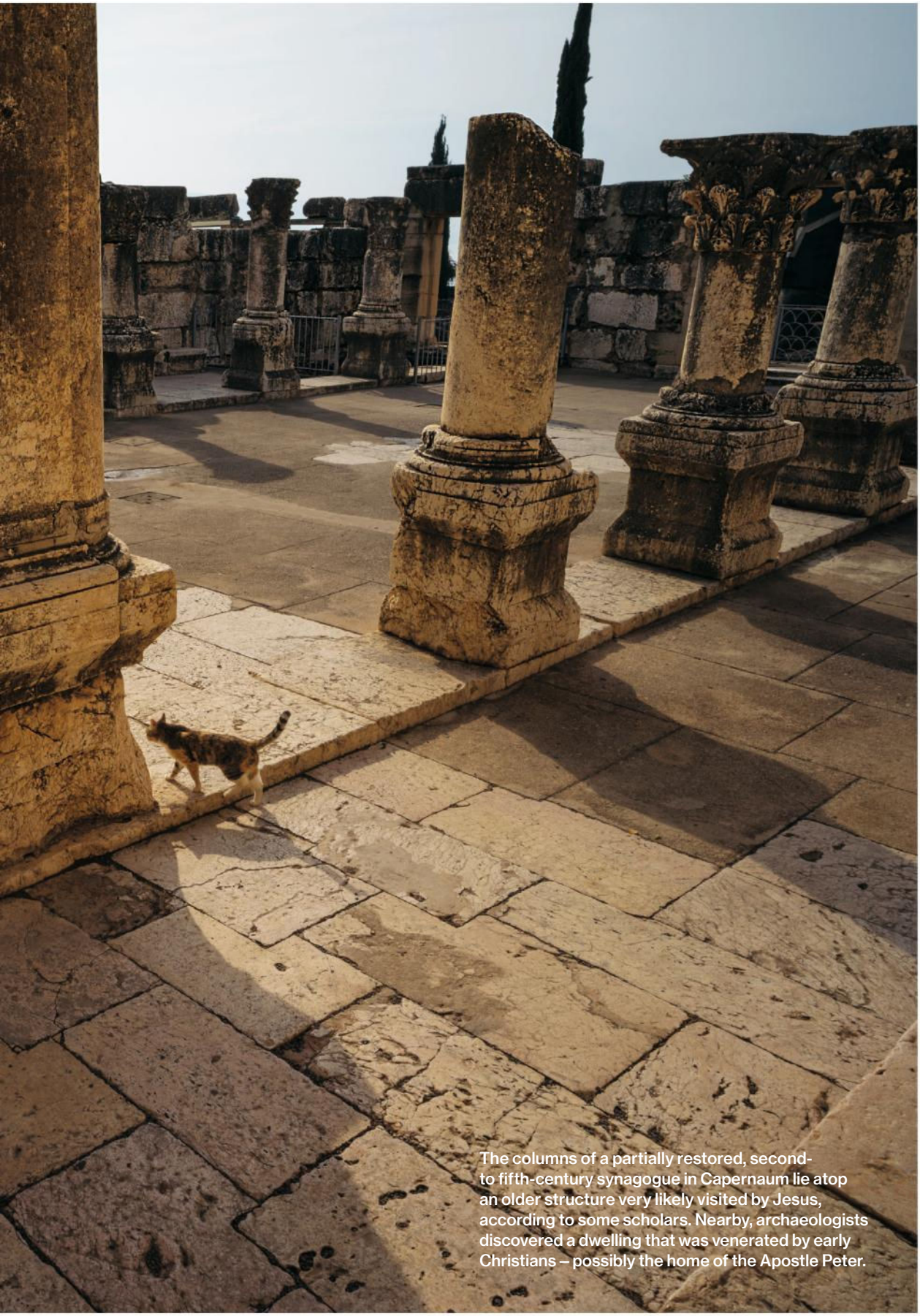
Scholars who study Jesus divide into two opposing camps separated by a very bright line: those who believe the wonder-working Jesus of the Gospels is the real Jesus, and those who think the real Jesus—the man who inspired the myth—hides below the surface of the Gospels and must be revealed by historical research and literary analysis. Both camps claim archaeology as their ally, leading to some fractious debates and strange bedfellows.

WHOEVER JESUS CHRIST was or is—God, man, or the greatest literary hoax in history—the diversity and devotion of his modern disciples are on colorful parade when I arrive in Bethlehem, the ancient city traditionally identified as his birthplace. The tour buses that cross the checkpoint from Jerusalem to the West Bank carry a virtual United Nations of pilgrims. One by one the buses park and discharge their passengers, who emerge blinking in the dazzling sun: Indian women in splashy saris, Spaniards in backpacks emblazoned with the logo of their local parish, Ethiopians in snow-white robes with indigo crucifixes tattooed on their foreheads.

I catch up to a group of Nigerian pilgrims in Manger Square and follow them through the low entrance of the Church of the Nativity. The soaring aisles of the basilica are shrouded in tarps and scaffolding. A conservation team is busy cleaning centuries of candle soot from the 12th-century gilded mosaics that flank the upper walls, above elaborately carved cedar beams erected in the sixth century. We carefully circle a section of

PANORAMA COMPOSED OF SEVEN IMAGES





The columns of a partially restored, second- to fifth-century synagogue in Capernaum lie atop an older structure very likely visited by Jesus, according to some scholars. Nearby, archaeologists discovered a dwelling that was venerated by early Christians – possibly the home of the Apostle Peter.

floor cut open to reveal the earliest incarnation of the church, built in the 330s on orders of Rome's first Christian emperor, Constantine.

Another series of steps takes us down into a lamp-lit grotto and a small marble-clad niche. Here, a silver star marks the very spot where, according to tradition, Jesus Christ was born. The pilgrims ease to their knees to kiss the star and press their palms to the cool, polished stone. Soon a church official entreats them to hurry along and give others a chance to touch the holy rock—and, by faith, the Holy Child.

The Church of the Nativity is the oldest Christian church still in daily use, but not all scholars are convinced that Jesus of Nazareth was born in Bethlehem. Only two of the four Gospels mention his birth, and they provide diverging accounts: the traditional manger and shepherds in Luke; the wise men, massacre of children, and flight to Egypt in Matthew. Some suspect that the Gospel writers located Jesus' Nativity in Bethlehem to tie the Galilean peasant to the Judaean city prophesied in the Old Testament as the birthplace of the Messiah.

Might it be possible that Jesus Christ never even existed, that the whole stained glass story is pure invention?

Archaeology is largely silent on the matter. After all, what are the odds of unearthing any evidence of a peasant couple's fleeting visit two millennia ago? Excavations at and around the Church of the Nativity have so far turned up no artifacts dating to the time of Christ, nor any sign that early Christians considered the site sacred. The first clear evidence of veneration comes from the third century, when the theologian Origen of Alexandria visited Palestine and noted, "In Bethlehem there is shown the cave where [Jesus] was born." Early in the fourth century, the emperor Constantine sent an imperial delegation to the Holy Land to identify places associated with the life of Christ and hallow them with churches and shrines. Having located what they believed was the site of the Nativity grotto, the delegates erected an elaborate church, the forerunner of the present-day basilica.

Many of the scholars I spoke to are neutral on the question of Christ's birthplace, the physical evidence being too elusive to make a call. To their minds, the old adage that I learned in Archaeology 101—"Absence of evidence isn't evidence of absence"—applies here.

IF THE TRAIL of the real Jesus has gone cold in Bethlehem, it grows much warmer 65 miles north in Galilee, the rolling hill country of northern Israel. As the names "Jesus of Nazareth" and "Jesus the Nazarene" suggest, Jesus was raised in Nazareth, a small, agricultural village in southern Galilee. Scholars who understand him in strictly human terms—as a religious reformer, or a social revolutionary, or an apocalyptic prophet, or even a Jewish jihadist—plumb the political, economic, and social currents of first-century Galilee to discover the forces that gave rise to the man and his mission.

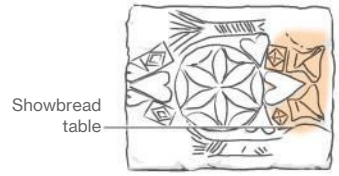
By far the mightiest force at the time shaping life in Galilee was the Roman Empire, which had subjugated Palestine some 60 years before Jesus' birth. Almost all Jews chafed under Rome's ironfisted rule, with its oppressive taxes and idolatrous religion, and many scholars believe this social unrest set the stage for the Jewish agitator who burst onto the scene denouncing the rich and powerful and pronouncing blessings on the poor and marginalized.

Others imagine the onslaught of Greco-Roman culture molding Jesus into a less Jewish, more cosmopolitan champion of social justice. In 1991 John Dominic Crossan published a bombshell of a book, *The Historical Jesus,* in which he put forward the theory that the real Jesus was a wandering sage whose countercultural lifestyle and subversive sayings bore striking parallels to the Cynics. These peripatetic philosophers of ancient Greece, while not cynical in the modern sense of the word, thumbed their unwashed noses at social conventions such as

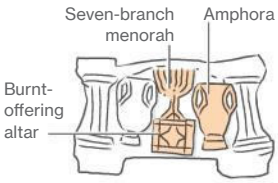


TREASURE FROM JESUS' TIME

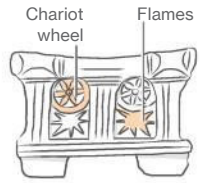
Unearthed in a synagogue in the hometown of Mary Magdalene, the Magdala Stone is thought to be modeled after the Jewish Temple in Jerusalem and may have served as a ceremonial Torah stand. It's shown here in Israel's national treasures storerooms.



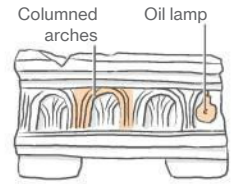
TOP
Depicts the curtain that hid the most sacred room of the Temple, the holy of holies



FRONT
Reliefs show the altar and menorah in the Temple court



BACK
Flaming chariot wheels symbolize the divine presence



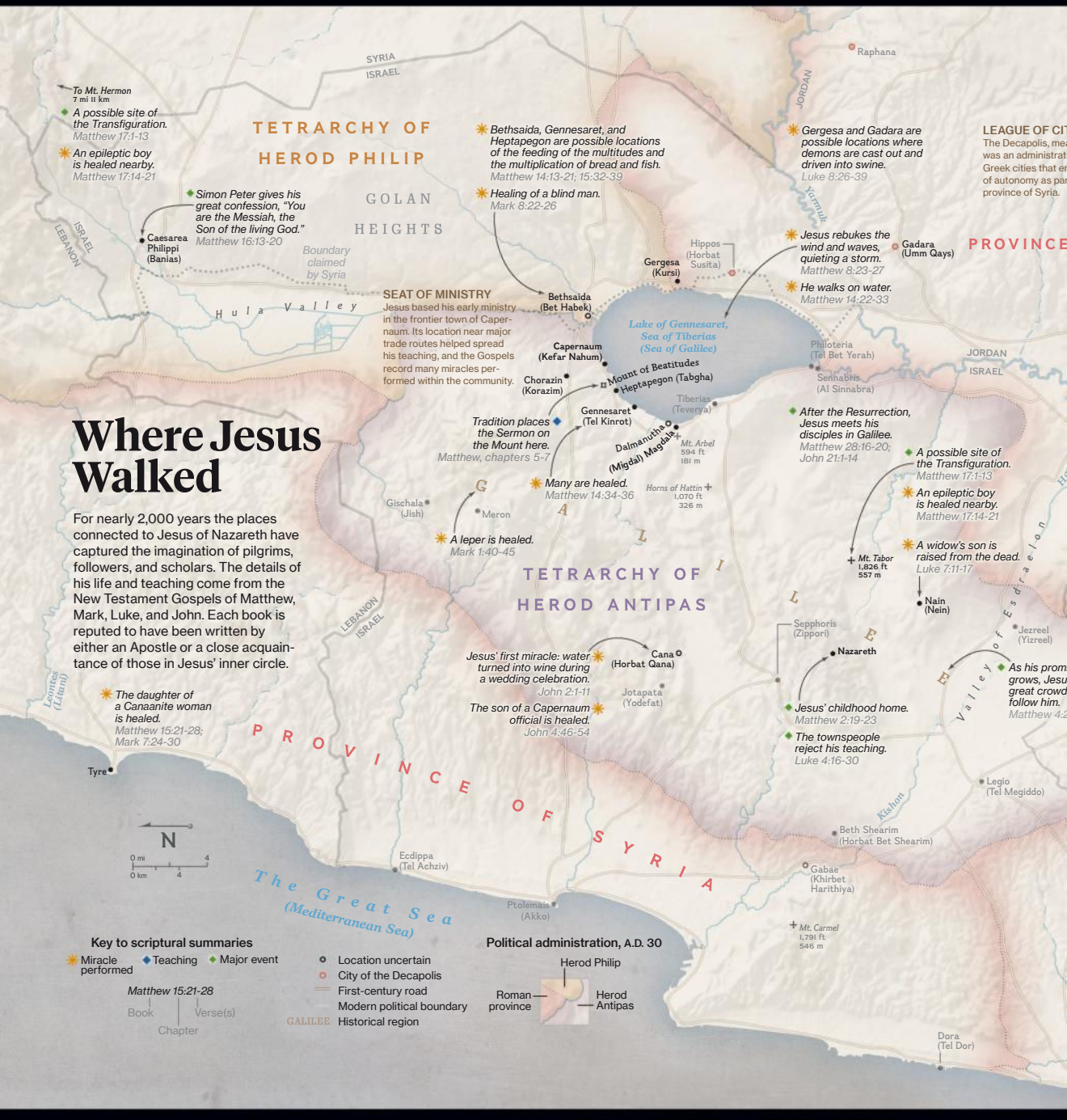
SIDE
Re-creation of the Temple's arched passageways

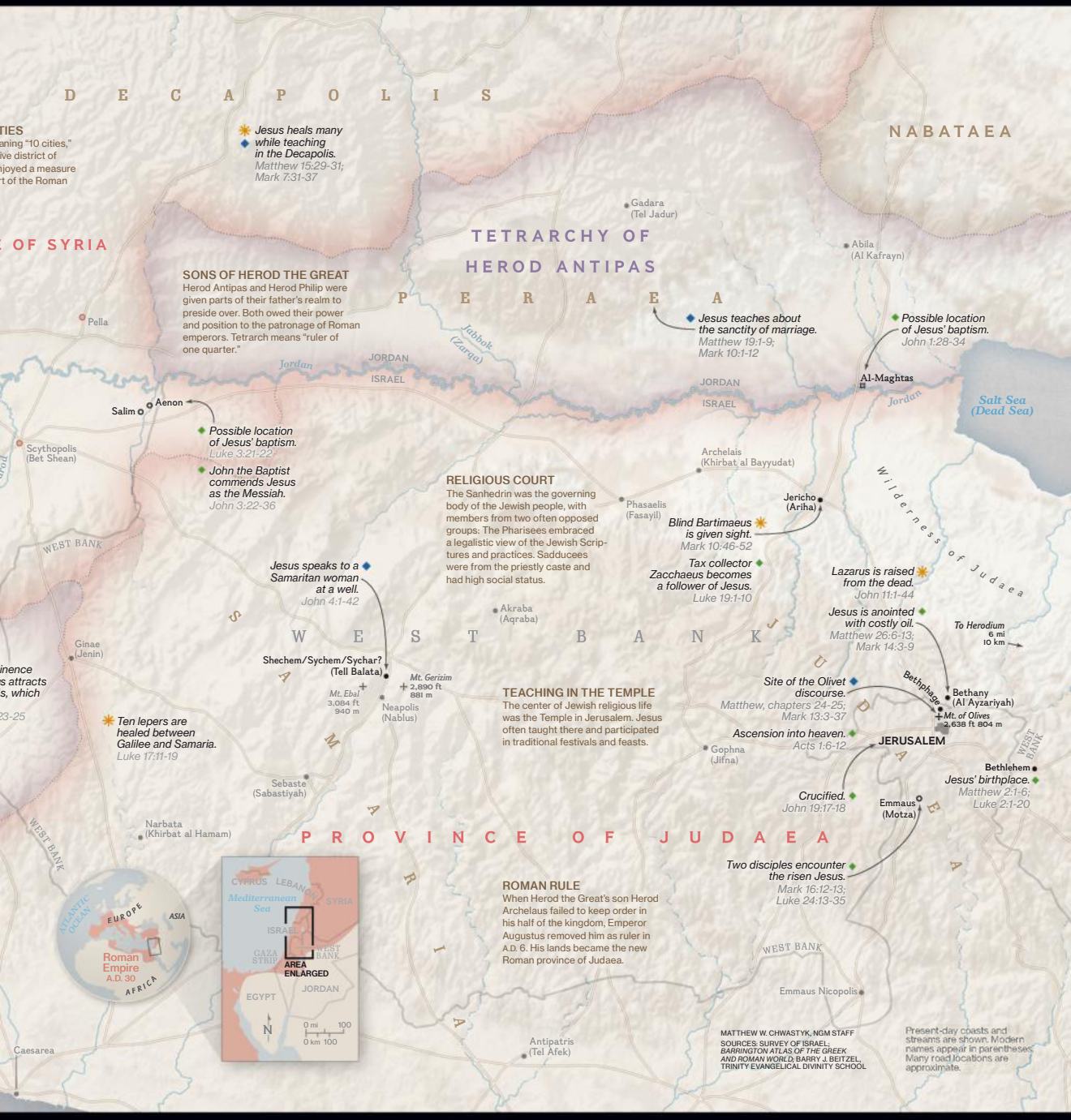
cleanliness and the pursuit of wealth and status.

Crossan's unorthodox thesis was inspired partly by archaeological discoveries showing that Galilee—long thought to have been a rural backwater and an isolated Jewish enclave—was in fact becoming more urbanized and romanized during Jesus' day than scholars once imagined, and partly by the fact that Jesus' boyhood home was just three miles from Sepphoris, the Roman provincial capital. Although the city isn't mentioned in the Gospels, an ambitious building campaign fueled by Galilee's ruler, Herod Antipas, would have attracted skilled workers from all the surrounding villages. Many scholars think it's reasonable to imagine Jesus, a young craftsman living nearby, working at Sepphoris—and, like a college freshman, testing the boundaries of his religious upbringing.

On a brilliant spring day after rains have left the Galilean hills awash with wildflowers, I hike around the ruins of Sepphoris with Eric and Carol Meyers, the Duke University archaeologists I consulted at the start of my odyssey. The husband-and-wife team spent 33 years excavating the sprawling site, which became the nexus of a heated academic debate about the Jewishness of Galilee and, by extension, of Jesus himself. Eric Meyers, lanky *(Continued on page 60)*

ART: FERNANDO G. BAPTISTA, NGM STAFF. SOURCE: RINA TALGAM, HEBREW UNIVERSITY OF JERUSALEM


Where Jesus Walked
For nearly 2,000 years the places connected to Jesus of Nazareth have captured the imagination of pilgrims, followers, and scholars. The details of his life and teaching come from the New Testament Gospels of Matthew, Mark, Luke, and John. Each book is reputed to have been written by either an Apostle or a close acquaintance of those in Jesus' inner circle.
SYRIA
ISRAEL
TETRARCHY OF HERODE PHILIP
GOLAN HEIGHTS
ISRAEL
LEBANON
Hula Valley
Boundary claimed by Syria
To Mt. Hermon 7 mi 11 km
A possible site of the Transfiguration. Matthew 17:1-13
An epileptic boy is healed nearby. Matthew 17:14-21
Simon Peter gives his great confession, "You are the Messiah, the Son of the living God." Matthew 16:13-20
Caesarea Philippi (Banias)
Bethsaida, Gennesaret, and Heptapegon are possible locations of the feeding of the multitudes and the multiplication of bread and fish. Matthew 14:13-21; 15:32-39
Healing of a blind man. Mark 8:22-26
SEAT OF MINISTRY
Jesus based his early ministry in the frontier town of Capernaum. Its location near major trade routes helped spread his teaching, and the Gospels record many miracles performed within the community.
Bethsaida (Bet Habek)
Gergesa (Kursi)
Hippos (Horbat Susita)
Lake of Gennesaret, Sea of Tiberias (Sea of Galilee)
Capernaum (Kefar Nahum)
Mount of Beatitudes
Heptapegon (Tabgha)
Chorazin (Korazim)
Gennesaret (Tel Kinrot)
Tiberias (Teverya)
Dalmanutha (Migdal) Magdala
Mt. Arbel 594 ft 181 m
Tradition places the Sermon on the Mount here. Matthew, chapters 5-7
Many are healed. Matthew 14:34-36
Horns of Hattin 1,070 ft 326 m
Gischala (Jish)
Meron
A leper is healed. Mark 1:40-45
GALILEE
TETRARCHY OF HERODE ANTIPAS
LEBANON
ISRAEL
Jesus' first miracle: water turned into wine during a wedding celebration. John 2:1-11
Cana (Horbat Qana)
Jotapata (Yodefat)
The son of a Capernaum official is healed. John 4:46-54
The daughter of a Canaanite woman is healed. Matthew 15:21-28; Mark 7:24-30
Leontes (Litani)
PROVINCE OF SYRIA
Tyre
The Great Sea (Mediterranean Sea)
Ecdippa (Tel Achziv)
Ptolemais (Akko)
N
0 mi 4
0 km 4
Key to scriptural summaries
Miracle performed
Teaching
Major event
Matthew 15:21-28
Book
Chapter
Verse(s)
Location uncertain
City of the Decapolis
First-century road
Modern political boundary
GALILEE Historical region
Political administration, A.D. 30
Herod Philip
Roman province
Herod Antipas
Raphana
JORDAN
Gergesa and Gadara are possible locations where demons are cast out and driven into swine. Luke 8:26-39
Jesus rebukes the wind and waves, quieting a storm. Matthew 8:23-27
He walks on water. Matthew 14:22-33
Gadara (Umm Qays)
LEAGUE OF CI
The Decapolis, mea
was an administrat
Greek cities that er
of autonomy as par
province of Syria.
PROVINCE
Philoteria (Tel Bet Yerah)
Sennabris (Al Sinnabra)
JORDAN
ISRAEL
After the Resurrection, Jesus meets his disciples in Galilee. Matthew 28:16-20; John 21:1-14
A possible site of the Transfiguration. Matthew 17:1-13
An epileptic boy is healed nearby. Matthew 17:14-21
A widow's son is raised from the dead. Luke 7:11-17
Mt. Tabor 1,826 ft 557 m
Nain (Nein)
Sepphoris (Zippori)
Nazareth
Jesus' childhood home. Matthew 2:19-23
The townspeople reject his teaching. Luke 4:16-30
Valley of Esdraelon
Jezreel (Yizreel)
As his prom
grows, Jesu
great crowd
follow him.
Matthew 4:2
Legio (Tel Megiddo)
Kishon
Beth Shearim (Horbat Bet Shearim)
Gabae (Khirbet Harithiya)
Mt. Carmel 1,791 ft 546 m
Dora (Tel Dor)


D E C A P O L I S
TIES
aning "10 cities,"
ve district of
njoyed a measure
rt of the Roman
Jesus heals many while teaching in the Decapolis.
Matthew 15:29-31; Mark 7:31-37
NABATAEA
Gadara (Tel Jadur)
TETRARCHY OF HEROD ANTIPAS
Abila (Al Kafrayn)
SONS OF HEROD THE GREAT
Herod Antipas and Herod Philip were given parts of their father's realm to preside over. Both owed their power and position to the patronage of Roman emperors. Tetrarch means "ruler of one quarter."
P E R A E A
Pella
Jesus teaches about the sanctity of marriage.
Matthew 19:1-9; Mark 10:1-12
Possible location of Jesus' baptism.
John 1:28-34
Jabbok (Zarqa)
Jordan
JORDAN
ISRAEL
Al-Maghtas
Salt Sea (Dead Sea)
Salim
Aenon
Possible location of Jesus' baptism.
Luke 3:21-22
John the Baptist commends Jesus as the Messiah.
John 3:22-36
Scythopolis (Bet Shean)
Archelais (Khirbat al Bayyudat)
RELIGIOUS COURT
The Sanhedrin was the governing body of the Jewish people, with members from two often opposed groups: The Pharisees embraced a legalistic view of the Jewish Scriptures and practices. Sadducees were from the priestly caste and had high social status.
Phasaelis (Fasayil)
Jericho (Ariha)
Blind Bartimaeus is given sight.
Mark 10:46-52
Tax collector Zacchaeus becomes a follower of Jesus.
Luke 19:1-10
Wilderness of Judaea
WEST BANK
Lazarus is raised from the dead.
John 11:1-44
Jesus is anointed with costly oil.
Matthew 26:6-13; Mark 14:3-9
To Herodium 6 mi 10 km
Jesus speaks to a Samaritan woman at a well.
John 4:1-42
Akraba (Aqraba)
S A M A R I A
W E S T B A N K
J U D A E A
Ginae (Jenin)
Shechem/Sychem/Sychar? (Tell Balata)
Mt. Gerizim 2,890 ft 881 m
Mt. Ebal 3,084 ft 940 m
Neapolis (Nablus)
TEACHING IN THE TEMPLE
The center of Jewish religious life was the Temple in Jerusalem. Jesus often taught there and participated in traditional festivals and feasts.
Site of the Olivet discourse.
Matthew, chapters 24-25; Mark 13:3-37
Bethphage
Bethany (Al Ayzariyah)
Mt. of Olives 2,638 ft 804 m
Ten lepers are healed between Galilee and Samaria.
Luke 17:11-19
Ascension into heaven.
Acts 1:6-12
JERUSALEM
Gophna (Jifna)
WEST BANK
Bethlehem
Jesus' birthplace.
Matthew 2:1-6; Luke 2:1-20
Sebaste (Sabastiyah)
Crucified.
John 19:17-18
Emmaus (Motza)
Narbata (Khirbat al Hamam)
P R O V I N C E O F J U D A E A
Two disciples encounter the risen Jesus.
Mark 16:12-13; Luke 24:13-35
ROMAN RULE
When Herod the Great's son Herod Archelaus failed to keep order in his half of the kingdom, Emperor Augustus removed him as ruler in A.D. 6. His lands became the new Roman province of Judaea.
WEST BANK
Emmaus Nicopolis
Antipatris (Tel Afek)
Caesarea
ATLANTIC OCEAN
EUROPE
ASIA
AFRICA
Roman Empire A.D. 30
CYPRUS
LEBANON
SYRIA
Mediterranean Sea
ISRAEL
GAZA STRIP
WEST BANK
AREA ENLARGED
EGYPT
JORDAN
N
0 mi 100
0 km 100
MATTHEW W. CHWASTYK, NGM STAFF
SOURCES: SURVEY OF ISRAEL; BARRINGTON ATLAS OF THE GREEK AND ROMAN WORLD; BARRY J. BEITZEL, TRINITY EVANGELICAL DIVINITY SCHOOL
Present-day coasts and streams are shown. Modern names appear in parentheses. Many road locations are approximate.

Was This the Tomb of Jesus?

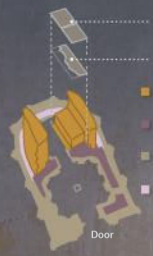
Archaeologists have discovered that Jerusalem's Church of the Holy Sepulchre stands on the site of a Jewish cemetery dating to the time of Jesus. The shrine at the heart of the church, known as the Edicule (right), encases remnants of a tomb revered since the fourth century. Was this Jesus' tomb? The evidence is inconclusive, but the site's layered history, illustrated here, holds many clues.

STARTLING REVELATION

During the 2016 restoration of the Edicule, technicians used ground-penetrating radar and other tools to peer behind the shrine's walls. They were stunned to discover earlier walls still intact, including pieces of a tomb cut from the bedrock.

Tomb chamber

Recent study revealed parts of a tomb from Jesus' day. The "holy rock" hallowed as the bed on which Christ's body lay is covered by later slabs.





Chapel of the Angel

The altar contains part of the stone said to have been rolled away from Jesus' tomb by an angel.

DETAIL ABOVE

JERUSALEM THROUGH TIME

Captured
Destroyed
Peaceful transition

Religion of primary power

Other
Muslim
Christian
Jewish

AD 2000

1927 Major earthquake damages the church and Edicule

1810 Edicule restored

1750

1719 Rotunda dome restored

1555 Edicule rebuilt

1500

CRUSADERS' CHURCH

TODAY

CHURCH OF THE HOLY SEPULCHRE

Dedicated in 1149, the current church dates to the crusader era, though portions are older. Pilgrims and tourists from around the world visit the historic basilica each year.



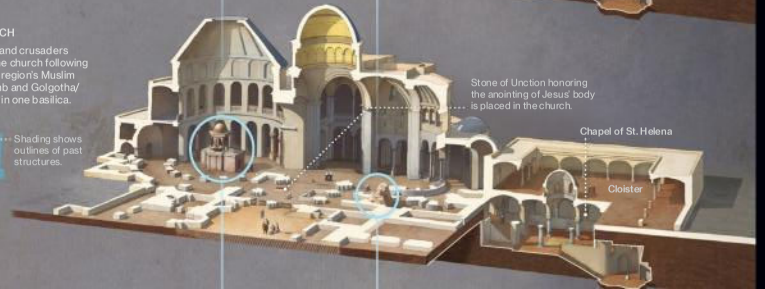


11TH-12TH CENTURY

CRUSADERS' CHURCH

Byzantine Christians and crusaders rebuild and expand the church following its destruction by the region's Muslim ruler in 1009. The tomb and Golgotha/Calvary are enclosed in one basilica.





1200s During Crusades, Jerusalem changes hands many times

1250

1099 Crusaders retake Jerusalem and rebuild and expand the church

1048 Byzantine restoration complete

1000

1009 Egyptian caliph orders destruction of all churches

750

614 Persians damage Church of the Holy Sepulchre

500

313 Edict of Milan legalizes Christianity

250

41-44 New wall built; Jesus' tomb now inside city

ca 30 Jesus is crucified and buried outside city wall

A.D. 1

CONSTANTINE'S CHURCH

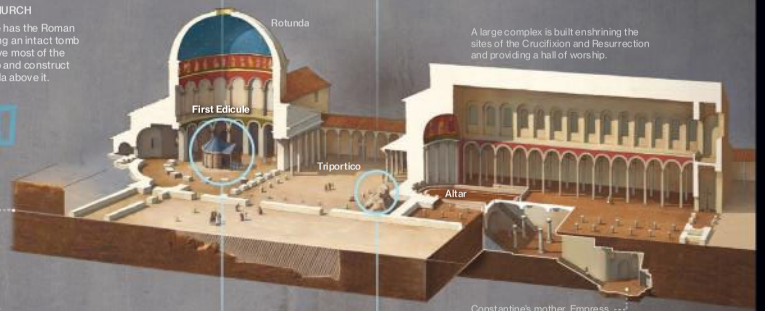
HADRIAN'S TEMPLE

A.D. 325-335

CONSTANTINE'S CHURCH

Emperor Constantine has the Roman temple razed, revealing an intact tomb below. Builders remove most of the rock around the tomb and construct an edicule and rotunda above it.





A large complex is built enshrining the sites of the Crucifixion and Resurrection and providing a hall of worship.

A.D. 135

HADRIAN'S TEMPLE

Emperor Hadrian builds a pagan temple over the tomb. Later Christian writers saw this as a bid to desecrate the site and erase the memory of Jesus, but scholars dispute that claim.





Constantine's mother, Empress Helena, finds crosses from Golgotha here, tradition holds.

By some accounts, a statue of Venus is placed on the site of Golgotha.

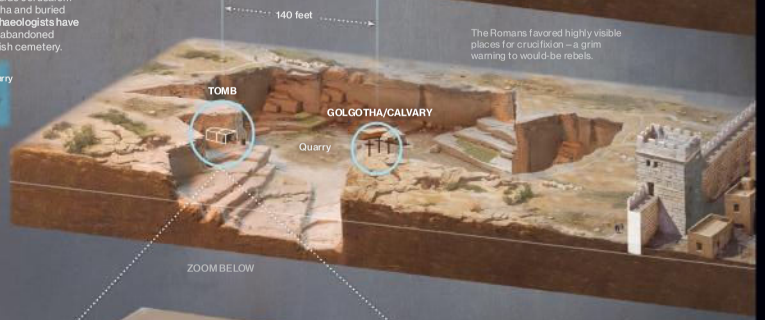
Hadrian's workers fill the quarry and pave it over with stone.

ca A.D. 30

IN THE TIME OF JESUS

Jesus is crucified outside Jerusalem on a hill called Golgotha and buried **in a nearby tomb. Archaeologists have** found evidence of an abandoned quarry used as a Jewish cemetery.





The Romans favored highly visible places for crucifixion – a grim warning to would-be rebels.

ZOOM BELOW



Jewish family tombs in Jesus' day had one or more burial chambers with long niches cut in the walls for bodies.

Tombs were sealed with movable stones that were usually square, though some were round.

Tombs had a cavelike foyer, leading to reports that Jesus was buried in a cave.

UPON THIS ROCK

The illustration at right is based on remnants of the tomb revealed during the 2016 restoration of the Edicule. But scholars debate the details. In other tombs discovered nearby, the dead were placed inside burial niches dug into the wall (far right) rather than laid on benches.

FERNANDO G. BAPTISTA, NGM STAFF; LAWSON PARKER, VICTORIA SGARRO, ART; FERNANDO G. BAPTISTA, NGM STAFF; ROCIO ESPIN

SOURCES: MARTIN BIDDLE, UNIVERSITY OF OXFORD; JODI MAGNESS, UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL; FATHER ATHANASIUS MACORA; FATHER EUGENIO ALLIATA, STUDIUM BIBLICUM FRANCISCANUM; ERIC H. CLINE, GEORGE WASHINGTON UNIVERSITY; BELEN BRAVO DE RUEDA. SPECIAL THANKS TO: ANTONIA MOKIOPOULOU, NATIONAL TECHNICAL UNIVERSITY OF ATHENS

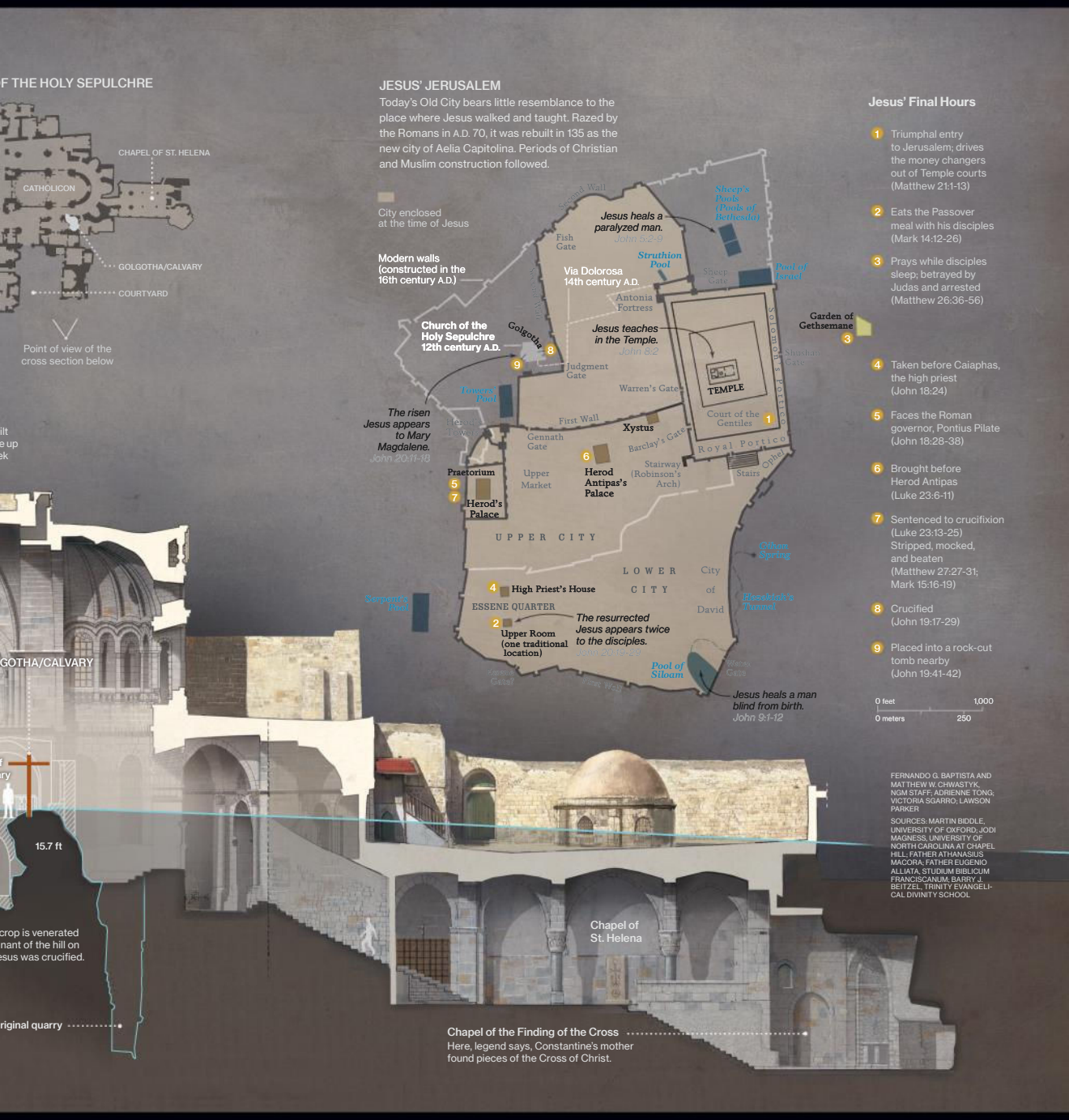
Christianity's Holiest Site

Founded in the fourth century, Jerusalem's Church of the Holy Sepulchre enshrines the place where many Christians believe Jesus Christ was crucified, buried, and raised from the dead.



EVOLUTION OF THE EDICULE

When an imperial delegation identified the site believed to be the burial place of Christ, Emperor Constantine had an ornate shrine built around the tomb. Known as the Edicule, the small structure, like the vast church, has undergone many changes.



FERNANDO G. BAPTISTA AND MATTHEW W. CHWASTYK, NGM STAFF; ADRIENNE TONG; VICTORIA SGARRO; LAWSON PARKER

SOURCES: MARTIN BIDDLE, UNIVERSITY OF OXFORD; JODI MAGNESS, UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL; FATHER ATHANASIUS MACORA; FATHER EUGENIO ALLIATA, STUDIUM BIBLICUM FRANCISCANUM; BARRY J. BEITZEL, TRINITY EVANGELICAL DIVINITY SCHOOL



During Passover, Samaritan men walk to the top of Mount Gerizim – the site, they believe, of God's true temple, rather than Jerusalem. The Samaritans of Jesus' day were despised as infidels, yet Jesus, in one of his most famous parables, cast a "good Samaritan" as an exemplar of neighborly love.



WATCH ON NATIONAL GEOGRAPHIC

Modern scientists investigate ancient traditions in *Secrets of Christ's Tomb,* a one-hour Explorer Special airing at 9/8c on Sunday, December 3.

and white-haired, pauses in front of a pile of columns. "It was pretty acrimonious," he says, recalling the decades-long dispute over the influence of a hellenizing city on a young Jewish peasant. He stops at the top of a hill and waves his hands across a sprawl of neatly excavated walls. "We had to dig through a bivouac from the 1948 war, including a live Syrian shell, to get to these houses," he explains. "And underneath we found the *mikvaot*!"

At least 30 mikvahs, or Jewish ritual baths, dot the residential quarter of Sepphoris—the largest domestic concentration ever found by archaeologists. Along with ceremonial stone vessels and a striking absence of pig bones (pork being shunned by kosher-keeping Jews), they offer clear evidence that even this imperial Roman city remained a very Jewish place during Jesus' formative years.

This and other insights gleaned from excavations across Galilee have led to a significant shift in scholarly opinion, says Craig Evans, professor of Christian origins in the School of Christian Thought at Houston Baptist University. "Thanks to archaeology, there's been a big change in thinking—from Jesus the cosmopolitan Hellenist to Jesus the observant Jew."



Scenes from the life of Christ – including his infancy, triumphal entry into Jerusalem, and Last Supper – adorn a small Coptic Orthodox chapel in the Church of the Holy Sepulchre. Several Christian sects warily share the cavernous sanctuary, each laying claim to a chapel or other space. Keys to the church are entrusted to a local Muslim family.

WHEN JESUS was about 30 years old, he waded into the Jordan River with the Jewish firebrand John the Baptist and, according to New Testament accounts, underwent a life-changing experience. Rising from the water, he saw the Spirit of God descend on him "like a dove" and heard the voice of God proclaim, "This is my beloved Son, with whom I am well pleased." The divine encounter launched Jesus on a preaching and healing mission that began in Galilee and ended, three years later, with his execution in Jerusalem.

One of his first stops was Capernaum, a fishing town on the northwest shore of a large freshwater lake called, confusingly, the Sea of Galilee. Here Jesus met the fishermen who became his first followers—Peter and Andrew casting nets, James and John mending theirs—and established his first base of operation.

Commonly referred to on the Christian tour route as the "town of Jesus," the pilgrimage site of Capernaum today is owned by the Franciscans and surrounded by a high metal fence. A sign at the gate makes clear what's not allowed inside: dogs, guns, cigarettes, and short skirts. Directly beyond the gate is an incongruously modern church mounted on eight pillars that resembles a spaceship hovering above a pile of ruins. This is St. Peter's Memorial, consecrated in 1990 over one of the biggest discoveries made during the 20th century by archaeologists investigating the historical Jesus.

From its odd perch the church offers a stunning view of the lake, but all eyes are drawn to the



center of the building, where visitors peer over a railing and through a glass floor into the ruins of an octagonal church built some 1,500 years ago. When Franciscan archaeologists excavated beneath the structure in 1968, they discovered that it had been built on the remains of a first-century house. There was evidence that this private home had been transformed into a public meeting place in a short span of time.

By the second half of the first century—just a few decades after the Crucifixion of Jesus—the home's rough stone walls had been plastered over and household kitchen items replaced with oil lamps, characteristic of a community gathering place. Over the following centuries, entreaties to Christ were etched into the walls, and by the time Christianity became the official religion of the Roman Empire in the fourth century, the dwelling had been expanded into an elaborately decorated house of worship. Since then the structure has commonly been known as Peter's House, and while it's impossible to determine whether the disciple actually inhabited the home, many scholars say it's possible.

The Gospels note that Jesus cured Peter's mother-in-law, ill with fever, at her home in Capernaum. Word of the miracle spread quickly, and by evening a suffering crowd had gathered at her door. Jesus healed the sick and delivered people possessed by demons.

Accounts of large crowds coming to Jesus for healing are consistent with what archaeology reveals about first-century Palestine, where diseases such as leprosy and tuberculosis were rife. According to a study of burials in Roman Palestine by archaeologist Byron McCane, between two-thirds and three-quarters of the surveyed graves held the remains of children



Just hours before his arrest and Crucifixion, according to the Gospels, Jesus prayed in a garden called Gethsemane, probably from the Aramaic words for oil press. Today many pilgrims come to this grove of olive trees outside the walls of Jerusalem to remember the darkest night of Jesus' life.



and adolescents. Survive the perilous years of childhood, and your chances of living to old age greatly increased, McCane says. "During Jesus' time, getting past 15 was apparently the trick."

FROM CAPERNAUM I head south along the Sea of Galilee to a kibbutz (a communal farm) that in 1986 was the scene of great excitement—and an emergency excavation. A severe drought had drastically lowered the lake's water level, and as two brothers from the community hunted for ancient coins in the mud of the exposed lake bed, they spotted the faint outline of a boat. Archaeologists who examined the vessel found artifacts dating to the Roman era inside and next to the hull. Carbon 14 testing later confirmed the boat's age: It was from roughly the lifetime of Jesus.

Efforts to keep the discovery under wraps soon failed, and news of the "Jesus boat" sent a stampede of relic hunters scouring the lakeshore, threatening the fragile artifact. Just then the rains returned, and the lake level began to rise.

The round-the-clock "rescue excavation" that ensued was an archaeological feat for the record books. A project that normally would take months to plan and execute was completed, start to finish, in just 11 days. Once exposed to air, the boat's waterlogged timbers would quickly disintegrate. So archaeologists supported the remains with a fiberglass frame and polyurethane foam and floated it to safety.

Today the treasured boat has pride of place in a museum on the kibbutz, near the spot where it was discovered. Measuring seven and a half feet wide and 27 feet long, it could have accommodated 13 men—although there's no evidence that Jesus and his Twelve Apostles used this very vessel. To be candid, it's not much to look at: a skeleton of planks repeatedly patched and repaired until it was finally stripped and scuttled.

"They had to nurse this boat along until they couldn't nurse it any longer," says Crossan, who likens the vessel to "some of those cars you see in Havana." But its value to historians is incalculable, he says. Seeing "how hard they had to work to keep that boat afloat tells me a lot about the economics of the Sea of Galilee and the fishing at the time of Jesus."

ANOTHER DRAMATIC DISCOVERY occurred just over a mile south of the Jesus boat, at the site of ancient Magdala, the hometown of Mary Magdalene, a devoted follower of Jesus. Franciscan archaeologists began excavating part of the town during the 1970s, but the northern half lay under a defunct lakeside resort called Hawaii Beach.

Enter Father Juan Solana, a papal appointee charged with overseeing a pilgrimage guesthouse in Jerusalem. In 2004 Solana "felt the leading of Christ" to build a pilgrims' retreat in Galilee, so he set about raising millions of dollars and buying up parcels of waterfront land, including the failed resort. As construction was about to begin in 2009, archaeologists from the Israel Antiquities Authority showed up to survey the site, as required by law. After a few weeks of probing the rocky soil, they were startled to discover the buried ruins of a synagogue from the time of Jesus—the first such structure unearthed in Galilee.

If the skeptics were right, their claim would shred the Gospels' portrait of Jesus as a faithful synagogue-goer.

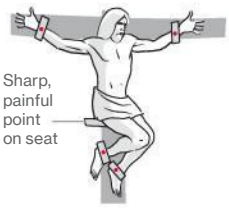
The find was especially significant because it put to rest an argument made by skeptics that no synagogues existed in Galilee until decades after Jesus' death. If those skeptics were right, their claim would shred the Gospels' portrait of Jesus as a faithful synagogue-goer who often proclaimed his message and performed miracles in these Jewish meeting places.

As archaeologists excavated the ruins, they uncovered walls lined with benches—indicating that this was a synagogue—and a mosaic floor. At the center of the room they were astounded to find a stone about the size of a footlocker that showed the most sacred elements of the Temple in Jerusalem carved in relief. The discovery of



DEATH ON A ROMAN CROSS

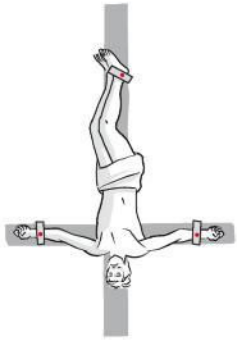
A crucified man's heel bone found in a family tomb may rebut the charge that Jesus, executed as a criminal, would not have been given a proper burial. Roman crucifixion took many forms.



The only crucifixion victim ever discovered had a nail driven through his heel (photo above).



Iron nails were rare and valuable, so the Romans used ropes more often than nails.



Church tradition says that the Apostle Peter was crucified upside down.



Jesus is traditionally depicted with his hands and feet nailed to the Cross.

the Magdala Stone, as the artifact has come to be called, struck a death blow to the once fashionable notion that Galileans were impious hillbillies detached from Israel's religious center.

As archaeologists continued to dig, they discovered an entire town buried less than a foot below the surface. The ruins were so well preserved that some began calling Magdala the "Israeli Pompeii."

Archaeologist Dina Avshalom-Gorni walks me through the site, pointing out the remains of storerooms, ritual baths, and an industrial area where fish may have been processed and sold. "I can just imagine women buying fish in the market right there," she says, nodding toward the foundations of stone stalls. And who knows? Maybe those women included the town's famous native daughter, Mary of Magdala.

Father Solana comes over to greet us, and I ask him what he tells visitors who want to know whether Jesus ever walked these streets. "We can't expect to answer that," he admits, "but we see the number of times that the Gospels mention Jesus in a Galilee synagogue." Considering the fact that the synagogue was active during his ministry and just a brief sail from Capernaum, Solana concludes, "we have no reason to deny or doubt that Jesus was here."

PHOTOGRAPHED AT TEL AVIV UNIVERSITY. ART: FERNANDO G. BAPTISTA, NGM STAFF. SOURCES: KRISTINA KILLGROVE, UNIVERSITY OF WEST FLORIDA; JODI MAGNESS, UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL



Ethiopian Orthodox pilgrims celebrate Easter atop the Church of the Holy Sepulchre. In a long dispute with Egyptian Copts, Ethiopian monks have occupied a rooftop monastery for more than 200 years to press their claim to a portion of the church.

ALESSIO ROMENZI



AT EACH STOP on my journey through Galilee, Jesus' faint footprints seemed to grow a bit more distinct, a shade more discernible. But it's not until I return to Jerusalem that they finally come into vivid focus. In the New Testament, the ancient city is the setting for many of his miracles and most dramatic moments: his triumphal entry, his cleansing of the Temple, his healing miracles at the Pools of Bethesda and Siloam—both of which have been uncovered by archaeologists—his clashes with the religious authorities, his last Passover meal, his agonized prayer in the Garden of Gethsemane, his trial and execution, his burial and Resurrection.

Unlike the disparate stories of Jesus' birth, the four Gospels reach much closer agreement in their account of his death. Following his arrival in Jerusalem for Passover, Jesus is brought before the high priest Caiaphas and charged with blasphemy and threats against the Temple. Condemned to death by the Roman governor Pontius Pilate, he's crucified on a hill outside the city walls and buried in a rock-cut tomb nearby.

The traditional location of that tomb, in what is now the Church of the Holy Sepulchre, is considered the holiest site in Christianity. It's also the place that sparked my quest for the real Jesus. In 2016 I made several trips to the church to document the historic restoration of the Edicule, the shrine that houses the reputed tomb of Jesus. Now, during Easter week, I return to see it in all its soot-scrubbed, reinforced glory.

Standing shoulder to shoulder with holiday pilgrims waiting to enter the tiny shrine, I recall the nights spent inside the empty church with the conservation team, coming upon darkened nooks etched with centuries of graffiti and burials of crusader kings. I marvel at the many archaeological discoveries made in Jerusalem and elsewhere over the years that lend credibility to the Scriptures and traditions surrounding the death of Jesus, including an ornate ossuary that may contain the bones of Caiaphas, an inscription attesting to the rule of Pontius Pilate, and a heel bone driven through with an iron crucifixion nail, found in the Jerusalem burial of a Jewish man named Yehohanan.

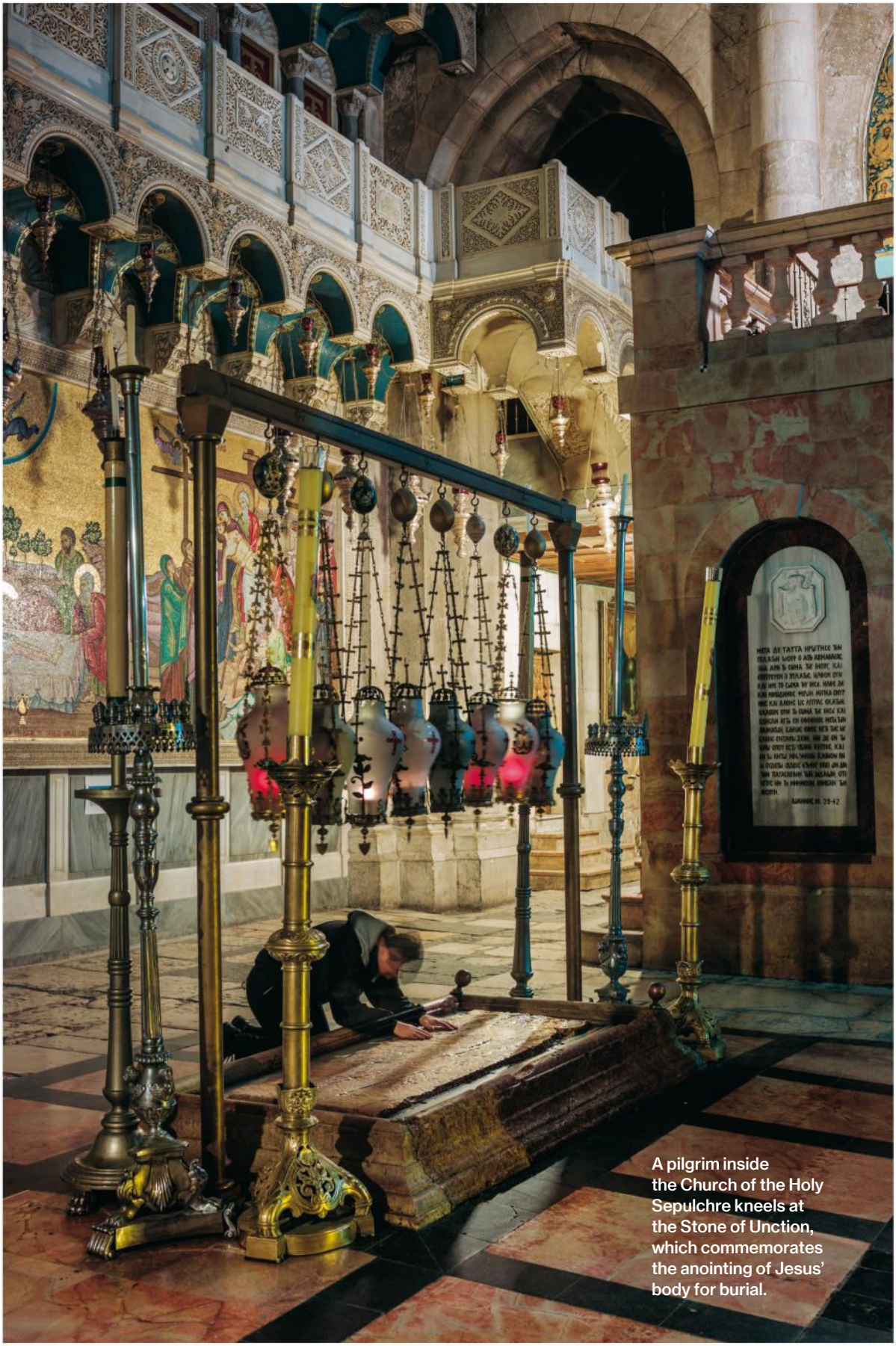
I'm also struck by the many lines of evidence that converge on this ancient church. Just yards from the tomb of Christ are other rock-hewn tombs of the period, affirming that this church, destroyed and rebuilt twice, was indeed constructed over a Jewish burial ground. I recall being alone inside the tomb after its marble cladding was briefly removed, overwhelmed that I was looking at one of the world's most important monuments—a simple limestone shelf that people have revered for millennia, a sight that hadn't been seen for possibly a thousand years. I was overwhelmed by all the questions of history I hoped this brief and spectacular moment of exposure would eventually answer.

Today, on my Easter visit, I find myself inside the tomb again, squeezed alongside three kerchiefed Russian women. The marble is back in place, protecting the burial bed from their kisses and all the rosaries and prayer cards rubbed endlessly on its time-polished surface. The youngest woman whispers entreaties for Jesus to heal her son Yevgeni, who has leukemia.

A priest standing outside the entrance loudly reminds us that our time is up, that other pilgrims are waiting. Reluctantly, the women stand up and file out, and I follow. At this moment I realize that to sincere believers, the scholars' quest for the historical, non-supernatural Jesus is of little consequence. That quest will be endless, full of shifting theories, unanswerable questions, irreconcilable facts. But for true believers, their faith in the life, death, and Resurrection of the Son of God will be evidence enough. □

Staff writer **Kristin Romey** covers ancient civilizations and new discoveries for the magazine and website. London-based **Simon Norfolk** specializes in photographing architecture and landscapes.

Photos, pages 30-32: 1) Scala/Art Resource, NY; 2-6) Getty Images; 7) the Palestinian Presidential Committee for the Restoration of the Nativity Church, Simon Norfolk; 8) Scala/Ministero dei Beni e delle Attività Culturali e del Turismo/Art Resource, NY; 9) the Palestinian Presidential Committee for the Restoration of the Nativity Church, Simon Norfolk; 10) Scala/Art Resource, NY; 11) Getty Images **SECOND ROW** 12) Scala/Art Resource, NY; 13-14) Getty Images; 15) Granger; 16) Alamy Stock Photo; 17) Getty Images; 18) Alamy Stock Photo; 19-22) Getty Images **THIRD ROW** 23-25) Getty Images; 26) the Trustees of the British Museum; 27) National Geographic Creative; 28-33) Getty Images **FOURTH ROW** 34) Getty Images; 35) Art Resource, NY; 36-37) Alamy Stock Photo; 38-39) Getty Images; 40) Alamy Stock Photo; 41) Art Resource, NY; 42) Granger; 43-44) Alamy Stock Photo **FIFTH ROW** 45-50) Getty Images; 51) Simon Norfolk; 52-53) Getty Images **SIXTH ROW** 54) the Trustees of the British Museum; 55) Alamy Stock Photo; 56) Getty Images; 57) Alamy Stock Photo; 58-59) Getty Images; 60) National Geographic Creative; 61-62) Getty Images



A pilgrim inside the Church of the Holy Sepulchre kneels at the Stone of Unction, which commemorates the anointing of Jesus' body for burial.



THE SHRINKING KINGDOM OF THE JAGUAR

The elusive predator of North and South America is celebrated as a spiritual symbol. Now the cat faces threats that could make its distinctive image just a memory.



A 10-month-old jaguar cub is caught in the infrared beam of a camera trap as it returns to the safety of a tree in Brazil's Pantanal region, the world's largest tropical wetland and one of the last bastions for jaguars. Mothers coax cubs into climbing trees early on so they can learn to avoid predators.



A mother grooms her cubs on the banks of the Três Irmãos river in the Pantanal. Jaguars mate at any time of year and bear a litter of one to four after about a hundred days. When the cubs are a couple of months old, the mother begins weaning them, exposing them to wounded prey to help them learn hunting skills.





BY CHIP BROWN / PHOTOGRAPHS BY STEVE WINTER

Maestro Juan Flores's apprentices brought my passport to the spirit world of jaguars in a small plastic chalice. It contained *"la medicina,"* a syrupy brown decoction of chacruna leaves and ayahuasca vines boiled down for two days and then decanted into old water bottles. At the start of the ceremony, the maestro consecrated the brew with exhalations of *mapacho* smoke, the wild Amazonian tobacco. And then he began filling the chalice, pouring doses of several ounces for each of the congregants.



Peruvian shaman Maestro Juan Flores stands by the Boiling River, once avoided by locals because of deadly jaguars and otherworldly forces. Today the only jaguars here are those he beckons from the spirit world. Maestro Juan sought traditional cures here after he was shot in the legs; he later founded the Mayantuyacu shamanic healing center nearby.

We waited on mats with blankets and plastic vomit buckets under the thatched roof of a large open-air pavilion called a maloca.

There were 28 of us—from the United States, Canada, Spain, France, Argentina, and Peru. We had all come in search of something to this remote outpost in the Peruvian Amazon built on the banks of a strange, lethally hot stream called the Boiling River. Some were hoping to find cures for serious afflictions; some were searching for direction; others simply wanted a glimpse into another world—the most esoteric corner of what Alan Rabinowitz broadly calls the "jaguar cultural corridor." This domain encompasses the habitats and migration paths that his conservation organization, Panthera, is trying to protect to ensure the survival of the estimated 100,000 jaguars and the vitality of their gene pool.

Small bats zigzagged in the rafters. Two dangling bulbs held back the darkness of the forest. The medicine was doled out silently over the drone of the river, where wraiths of steam swayed in eddies of cool night air. When the apprentices came to me, I got onto my knees, an old Roman Catholic habit maybe, or just what everyone else was doing. One apprentice handed me the chalice, another stood by with a glass of water. As you might before stepping off a cliff, I hesitated, thinking of what the well-known *curandero* Don José Campos had told me in the busy Peruvian port of Pucallpa a few days before.

"You don't take ayahuasca," he said. "It takes you."

I tipped the cup and drank.

I HAD COME TO SEE MAESTRO JUAN at Mayantuyacu, the shamanic healing center he founded in the 1990s, hoping to learn more about jaguars, particularly those aspects of the animal that can't be captured in camera traps. *Panthera onca* are the apex carnivores of North and South America. They are at once regal and ferocious, unrivaled in stealth, at home in rivers, on jungle ground, and in trees, their eyes glittering in the dark with the *tapetum lucidum* cells of their night-vision retinas. They have the most powerful bite, relative to their size, among the big cats. And, uniquely among the big cats, they bite the skulls rather than the throats of their prey, often piercing the brain and causing instant death. Their guttural, grating roar suggests nothing so

much as the bass note of the life force itself.

But for thousands of years jaguars have had a double life—a figurative existence that dominates the art and archaeology of pre-Columbian cultures across much of the species' historical range, from the southwestern U.S. to Argentina. Jaguars were worshipped as gods by the Olmec, the Maya, the Aztec, and the Inca, who carved jaguar effigies into their temples, their thrones, their pot handles, the spoons they made from llama bones. Images of the jaguar were woven into shawls and funeral shrouds of the Chavín people, whose civilization emerged in Peru around 900 B.C. Some tribes in the Amazon drank jaguar blood, ate jaguar hearts, and wore jaguar skins. Many believed that people could transform into jaguars and that jaguars could become human. To the Desana of northwestern Colombia, the jaguar was the manifestation of the sun; to the Tucano, the cat's roar heralded rain. The Mayan word *balam* denotes both jaguars and priests or sorcerers. Among the Mojo people of Bolivia, the prime candidates for the job of shaman were men who had survived a jaguar attack.

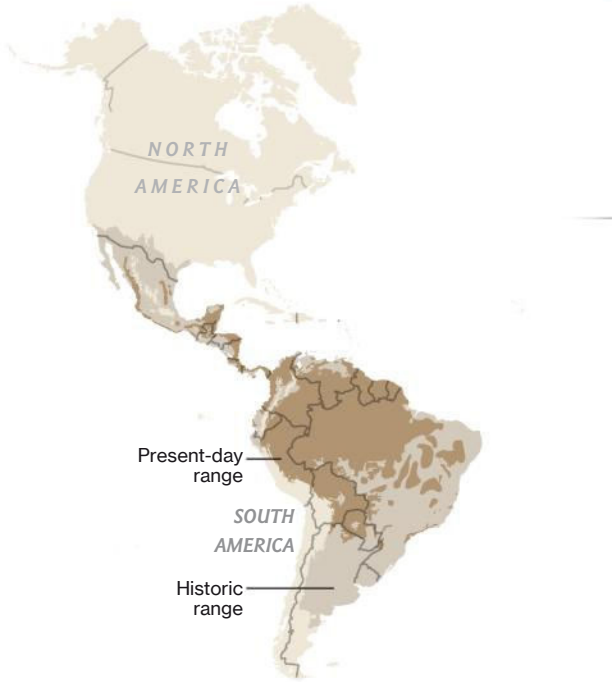
Even today, when the species has been pushed out of more than half its original range, modern signs of this ancient intimacy are everywhere. Each August, for example, in a festival called Tigrada, residents of the southwestern Mexican city of Chilapa de Alvarez petition the jaguar god Tepeyollotl for rain and abundant crops by parading through the streets in jaguar masks and spotted costumes. The image of a snarling jaguar can be found on everything from cans of one of Peru's most popular beers to beach towels, T-shirts, backpacks, rickshaws, fish shops, and gay bars.

Certainly the most mysterious aspect of the

Habitat corridors

Mapping jaguar populations helps identify crucial areas where they live and move in proximity to people. Conservationists are working with governments, businesses, and private parties to protect these regions.





Range reduction

Jaguars once ranged from the United States' arid Southwest to Argentina's grassy pampas. Since the mid-1800s, they've lost more than half of their former territory and have been pushed deeper into less suitable jungle tracts.

MATTHEW W. CHWASTYK, NGM STAFF. SOURCES: PANTHERA; IUCN; WDPA-WCMC, WORLD DATABASE ON PROTECTED AREAS; WWF

Keeping Jaguars Connected

Jaguars are a single species–with no subspecies–which means that all populations are connected through migration and breeding. Ensuring links through the Americas among core populations of these stealthy hunters, which are reluctant to cross unfamiliar areas, will be essential as their range is increasingly fragmented by human development.

In the crosshairs

As cities expand and land is developed, clashes between humans and jaguars increase. When their usual prey is gone, the big cats often attack livestock – and are killed in return. A market for their teeth and bones, prized for trinkets and folk remedies, increases their vulnerability.



jaguar's double life lies in the domain of the shaman and those extraordinary states of consciousness that aboriginal people of the upper Amazon have for millennia explored by way of psychotropic plants. In this occult realm where native healers claim they can trace the origin of all diseases and find cures with the help of spirits, the jaguar reigns as an ally, a guardian, a vital presence that can help cast out illness, catalyze transformations, and ward off dark forces. Among the cornucopia of Amazonian spirits said to dwell in lakes and rivers, in animals, and in the estimated 80,000 plant species that compose one of the planet's most prodigious ecosystems, the jaguar is first among equals.



Pictures of jaguars dominate rock art discovered on more than 80 cliff faces and outcroppings in Colombia's Chiribiquete National Park. For decades the park, located in one of South America's wildest jungles, remained off-limits as armed groups in the area battled the military. Scientists believe some of the depictions of the animals and other symbols could be up to 20,000 years old.

MAYANTUYACU LIES ABOUT 30 MILES southwest of Pucallpa. "There wasn't a road here four years ago," said Andrés Ruzo as our truck turned off the clay and gravel highway onto a rough track over ground recently deforested by ranchers. At the bottom of a steep hill was a sanctuary of cabins and thatched-roof buildings set among trees echoing with the burble and peal of oropendola birds. Ruzo had gotten to know Mayantuyacu and Maestro Juan over the course of seven years studying the Boiling River as a Ph.D. candidate at Southern Methodist University, supported in part by grants from National Geographic. Water heated deep underground wells up through faults in the Earth to feed the stream, roughly four miles long. Parts of it (some over 200°F) are hot enough to kill any creature that falls in.

For generations locals have recognized this geological anomaly as a spiritually significant place. Most steered clear of it—afraid of the spirits that inhabited its vapors and the physical jaguars lurking in the surrounding forest. But curanderos, as many prefer to call themselves, have long been coming here to partake of its powerful medicine. Students of a different kind of science, they learned their medical botany in a process called "dieting," in which they consumed and studied the effects of various preparations made from leaves, roots, barks, and sap. Their curriculum also drew on knowledge gleaned under the influence of ayahuasca, the psychotropic mother medicine central to the spiritual life of more than 70 indigenous tribes and mestizo cultures in the Amazon.

On our second evening at Mayantuyacu, Ruzo took photographer Steve Winter and me up to the cabin to meet Maestro Juan, one of the more famous curanderos in Peru. He was stretched out in a hammock, wearing only pants and smoking a mapacho. At 67, he seemed a man of few words, measured, stoic, watchful—fluent in Spanish but not the sort of person you could know too quickly or pepper with questions. He

WATCH ON NATIONAL GEOGRAPHIC WILD

Steve Winter and Bertie Gregory capture the remarkable lives of these big cats in *Jaguar vs. Croc*, December 10 at 9/8c on Nat Geo WILD.



has 14 children, ages 13 to 30. Some are now working at Mayantuyacu. He grew up in the tiny village of Santa Rosa, 10 miles east of the Boiling River, the son of a curandero. On a day his father happened to go out without his tobacco pipe and the protection of the master tobacco spirit, he was killed by a falling tree.

Juan was 10 then, but was able to continue his education when a curandero from the Ashaninka tribe accepted him as an apprentice. He went on to study with healers from many tribes and backgrounds. He founded Mayantuyacu after a brush with death when he stumbled into a hunter's trap and a blast from a rigged shotgun injured his legs, shattering a tibia. By the time he was carried to a hospital, he'd lost so much blood the doctors thought he might not live. They were sure he'd never walk without crutches.

A nurse suggested that a great curandero ought to be able to heal himself. So a week after the accident he took up his crutches and made the arduous pilgrimage up the Pachitea River and through the forest until he found a Came Renaco tree angled precariously over the Boiling River, its branches shrouded in steam. From the tree, he prepared bone-strengthening treatments. In a matter of months, he had the full use of his legs. Soon afterward, he married the nurse who had challenged him, and together they founded Mayantuyacu near the Came Renaco tree.

But now, more than two decades later, the health of the whole region around him is in decline. Much of the surrounding forest has been logged or burned off for cattle. The horizon is frequently flagged with plumes of black smoke.



A precision bite to its vulnerable skull quickly turns this caiman into a hearty meal. The cats will hunt on land, in water, and in trees. Their diet consists of more than 85 species, including deer, buffalo, sheep, cattle, wild pigs, sloths, monkeys, rodents, turtles, armadillos, and birds.



A Killer Bite

Jaguars have the most powerful bite – relative to their size – of all the big cats. Agile hunters both on land and in water, and with jaws that can slice straight through bone, jaguars can feed on armored prey ranging from armadillos to seemingly impenetrable caimans.

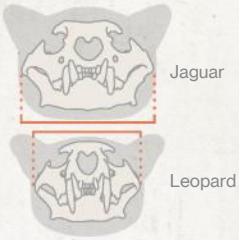
Strong jaws

The force of a jaguar's bite is about seven times its body weight.



More muscle power

The jaguar's skull is wider than that of other big cats, which makes room for bigger muscles on top of the head and along the jaw, adding extra force to its bite.

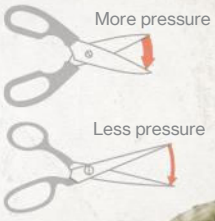


Targeted attack

A bite to the skull can cause instant death if it punctures the brain, while bites to the spine can paralyze prey.

Increased leverage

Short jaws act more like kitchen shears than scissors, boosting force near the jaw joint and adding to bite strength.



Tough teeth

The jaguar's short, wide canines are better for biting than long ones would be, but they can break or wear down with repeated attacks on armored prey.

- Bony plates called **osteoderms** protect a caiman's back, neck, and stomach.
- Brain and spine

MONICA SERRANO, NGM STAFF; SHELLEY SPERRY
ART: MAURICIO ANTÓN. SOURCES: ADAM HARTSTONE-ROSE, UNIVERSITY OF SOUTH CAROLINA; ANTHONY HERREL, MUSEUM OF NATURAL HISTORY, PARIS; HOWARD QUIGLEY, PANTHERA

Most of the animals have been hunted out. Even ayahuasca vines are harder to find—Mayantuyacu now imports them from other parts of Peru or Brazil. In 2013, the year the road was built, the Came Renaco tree Maestro Juan had found fell into the Boiling River and died.

Winter pulled out his laptop to show our host the jaguar photographs he'd taken in the Pantanal in Brazil. The curandero smiled and softened his guard. It was as if he were looking at snapshots from a branch of his family that had moved away. He seemed boyishly delighted watching video of a jaguar dive into a river and come out dragging a 150-pound caiman up the bank in its jaws.

When the show was over and Winter closed the computer, Maestro Juan lit a mapacho.

"The last jaguar in this area was killed two years ago," he said. Most of the people at Mayantuyacu, his apprentices, the workers who prepared the ayahuasca vines, had never seen jaguars except when they were summoned during ceremonies and arrived in visions. For them the cat existed only in the spirit world.

Maestro Juan said he often called jaguar spirits to guard the entrance of the maloca during ceremonies. There were two: one associated with the spotted jaguar, known as the *otorongo,* and the other one tied to its much rarer variant, the black jaguar, which he referred to as the *yanapuma*. He said he would call them at the next ceremony.

I had a question that seemed painful to ask because it was plain he understood the slow-motion apocalypse unfolding around him—the way of life that was going up in the smoke of burning fields and vanished game, and in the absence of the jaguar's roar. How can one call jaguar spirits from the forest if the forest has no jaguars?

"You can't erase a spirit," he said. "The body may have died, but the spirit is still here."

And yet he prayed that the jaguar would return, knowing a jungle with a jaguar is healthier than a jungle without the keen hunter that keeps other species in check. "They are good," he said quietly. "I hope they will come back."

IT HAD AN EARTHY TASTE, the ayahuasca in the chalice, acrid-sweet, sort of like molasses. When the last of the portions had been distributed, the lights were doused and darkness rushed in from the forest, darkness that seemed as formidable as the face of the black jaguar whose defiant eyes we had seen close up, burning through the steel bars of a pen in Pucallpa.

A half hour later, Maestro Juan, signaling that he could feel the effect of the medicine he drank along with everyone else, began to sing the first *icaro,* a monotone chant incorporating phrases from various languages plus gibberish vaguely reminiscent of Ella Fitzgerald scatting her way through "Mack the Knife." He sat cross-legged wearing a long striped robe, a headdress of bright green parrot feathers, and necklaces of large brown snail shells and crimson *huayruros* seeds and jaguar canines. His song seemed to move the energy through the room.

How can one call jaguar spirits from the forest if the forest has no jaguars?

Congregants who were not feeling any effects went up for a second cup, lighting their way to the maestro with their iPhones. Maestro Juan sang a chant that summoned the spirits of certain birds. Sometime later I heard him calling the jaguars to the maloca. I opened my eyes and found he had walked around the circle of mats and was sitting right in front of me.

He told me later the jaguars came and sat by the entrance of the maloca but did not stay long. "They were here only a while," he said. "And then they headed back deeper into the jungle."

I didn't see them. Ayahuasca didn't show me jaguars or any other animals of the spirit world.

What I did see over the next three hours made for one of the more revelatory experiences of my life. The moment that ayahuasca takes you is called the *mareación,* literally, "the dizziness,"



A jaguar chases a caiman in the Pantanal. Given the cats' broad diet and comfort in water, prowling a riverbank is "like scanning a buffet line," says biologist and National Geographic Emerging Explorer Luke Dollar. They will even dive into the water to snatch large fish.





a phrase that does no justice to the feeling of being ushered into another world, in my case, not the world of jaguar spirits but the secret kingdom of the plants. I felt I suddenly understood what it's like to worm through the dark, claustrophobic realm of roots; to reach up through cathedral-like vaults of shadow and light like the tendrils of an understory vine. And what it's like to know, as one intrinsically knows love or grief, that plants are as alive as any animal, simmering with intelligence, with sentience, with what truly seemed a kind of spirit.

I felt myself swept up in what the poet Dylan Thomas famously described as "the force that through the green fuse drives the flower," given to understand that there is a genius in the universe much larger than our own, ascending orders of genius braided into the DNA of every living thing. I heard other people singing out as if in celebration of the same epiphany; voices around the maloca breaking into song—hymns in Spanish sung by Peruvians who lived nearby and came to ceremonies two or three times a week; the chants of Maestro Juan and his apprentices; and some of the most exquisite wordless arias I have ever heard, icaros improvised in the moment, reverberating with joy, glistening like orchids made of sound.

I STAYED UP almost till dawn scribbling in my journal, knowing that nothing I could write would convey the beauty and strangeness of the night, the cascades of insight, the avalanches of laughter that overtook me when I realized the absurdity of my blinkered materialism and the

Society Grant Your National Geographic Society membership helped fund this project.



As a cub, this male jaguar was smuggled onto a bus in southern Colombia and was headed for the underground pet trade when he was rescued by authorities. His mother had been killed by a rancher whose cow she'd attacked. Since the young cat didn't learn survival skills from his mother, he can never be released into the wild. Today he lives in Cabildo Verde, a nature reserve in Sabana de Torres, Colombia.

general insanity of city life in New York, where nature is mostly rats, roaches, and the put-upon trees of Central Park. Over breakfast, I sat next to one of Maestro Juan's former apprentices, who had been stationed on a mat next to mine. He told me that during my laugh riot he had blown tobacco smoke my way, afraid I might be "going loco." I tried to tell him I had never felt saner.

Still, I had to wonder how real it all was. Scientists tend to dismiss ayahuasca as a hallucinogen and attribute many of the cures of curanderos to placebo effects, or the power of suggestion, the skillful shamanic use of set and setting. Spirits can't be verified or quantified. It made me queasy to recall the young Canadian I'd met who had a cancerous tumor in his leg but had turned down recommended surgery and radiation and was counting on a prescription of plants and insights gleaned from ayahuasca to cure him.

By the same token, Maestro Juan's conviction that nature was teeming with spirits seemed a lot less daft the morning after the ceremony. Not daft at all, in fact. He lived in a world that had not been turned into a machine. Where I might hear the sound of the river as merely water flowing over rock, he heard a chorus of voices, sometimes including the voice of his sister who had drowned in a lake as a little girl only to reappear to him years later in the spirit world as a *sirena*.

Who was to say she wasn't real? With his medicine, the maestro had shown everyone in the maloca what he knew of another world. What we wished to believe about the reality of it was up to us.

So many people from Europe and North America come to Mayantuyacu and other ayahuasca centers in Peru hoping to find some approximation of a "jaguar spirit" in themselves. (For some reason nobody covets an association with a Pucallpa squirrel.) The broader lesson of ayahuasca for me was that the jaguar's roar is one voice in an ecological symphony, and that too often we focus myopically on charismatic species—the big cats especially—and forget that a crucial part of what they are is where they live and the thousands of other organisms that live alongside them, ourselves included.

Some days later Ruzo told me of a vision that one of Maestro Juan's apprentices had had during the ceremony. He'd seen a jaguar skeleton, lying on its side by the Boiling River, legs, rib cage, skull, perfectly complete. Maestro Juan and Ruzo had discussed the significance of it at length.

Maestro Juan took the skeleton to mean that the jaguar—in any form—can no longer protect the forest around Mayantuyacu. He has no doubt now that it is up to him, to Ruzo, to conservationists everywhere who venerate the jaguar's power and grace, to keep the forest intact. □

Chip Brown wrote "Making a Man" for the January 2017 special issue, Gender Revolution. **Steve Winter** photographed jaguars for this feature in Brazil's Pantanal region, one of their remaining strongholds.



A mother and cub patrol along the Cuiabá River after dusk; the dim light offers good hunting. The Maya believed that jaguar spirits battled underworld forces at night to allow the sun to rise and life to go on. Now conservationists battle deforestation and poaching to allow the jaguar's world to endure.



ON THE TRAIL OF JAGUAR POACHERS

BY RACHAEL BALE / PHOTOGRAPHS BY CHRISTIAN RODRIGUEZ



As Chinese investment floods into Bolivia, the spotted cats are under siege because of a booming market for their teeth and skulls.



A downpour during the night had turned the greenish water of Río Quendeque angry and red with fresh mud, and the clouds looked ready to burst again any moment. Thankfully, we had the good boat, the one with the "roof"—an awning where giant Amazonian spiders and iridescent beetles were hanging out. I was on patrol with rangers from Madidi National Park in Bolivia, who were searching for clues about a growing problem in the rain forest.

Madidi, a bit smaller than New Jersey, is a stunning natural trove, with more than 11 percent of the world's bird species and 200 species of mammals. Even in the rainy season, when waist-deep mud can hobble you and insects seem hell-bent on eating you alive, it's magical. Scarlet macaws swoop overhead, swarms of green-blue Urania moths blanket mud puddles, and the giant trees that loom over all are so lush they block out the sky.

The park is also home to the jaguar, the mysterious spotted cat of the jungle that once roamed from the southwestern U.S. through Argentina. Jaguars have lost swaths of forest habitat to ranchland, farmland, and illegal logging, and they're often shot by people who fear them (even though jaguars very rarely attack humans) or who worry that the cats will kill their cattle (which they sometimes do). And now jaguars are facing a new threat: poaching for the illegal trade in wildlife.

Nowhere, perhaps, is this threat more evident than in Bolivia, where postal service employees have confiscated hundreds of jaguar teeth being smuggled to China. In separate court cases, two Chinese men are being tried on charges related to jaguar trafficking. And in towns across northern Bolivia, radio stations air advertisements by men with Chinese accents offering to buy jaguar parts from local people.

Bolivia's Madidi National Park is home to several hundred jaguars. Park director Marcos Uzquiano (at left) and his rangers have seen an uptick in interest from Chinese buyers looking for jaguar teeth to sell on the black market in their country.





Hunting jaguars, as well as buying, selling, and even possessing jaguar parts, is illegal in Bolivia and has been for years. So is trading in jaguar parts commercially across international borders. But in Bolivia it's often easy to get away with. Law enforcement is weak, and the price of teeth is high—sometimes $100 to $200 a tooth.

"People see it as a way of making money," says Nuno Negrões Soares, a biologist with a Bolivian conservation organization. "They know they're not going to get in trouble."

China's appetite for jaguars seems to be growing, given that tiger parts—especially teeth, which are worn as jewelry to show off wealth or as protection against evil—are increasingly hard to come by as those endangered cats get scarcer. Meanwhile, Chinese investment and infrastructure deals with Bolivia have brought an influx of Chinese workers, spurring more illegal activities, including jaguar trafficking, according to Anaí Holzmann, a jaguar conservationist in Bolivia.

"The workers know they can make extra money selling wildlife to China," she says. "So they do that, sometimes with the help of Bolivians and other Chinese, like people who own restaurants and nightclubs."

On our river patrol we came across an indigenous man in a boat laden with bananas. He noticed the rangers' uniforms as our boat pulled alongside his. After some small talk, Marcos Uzquiano, Madidi's director, turned the conversation to jaguars.

Left: In China jaguar teeth are likely being used as substitutes for tiger teeth, which are turned into necklaces worn as status symbols, or in the belief that they protect the wearer from evil. Above: The trade isn't limited to Bolivia. In a community outside Iquitos, Peru, villagers sell the skins of jaguars they shot. They say that once a year someone from a nearby Chinese corporation comes to buy the canines but not the skins.

STEVE WINTER (ABOVE)

Society Grant Your National Geographic Society membership helped fund this Wildlife Watch story. Visit *news.nationalgeographic.com/wildlife-watch* for more reporting on wildlife crime.



"A Chinese guy" came to his village last year, the man said. "He was looking for teeth and heads."

Uzquiano told me later that he suspects the Chinese man is the same person he'd heard was going from ranch to ranch in nearby villages, offering money to livestock owners for the skulls and teeth of any jaguar they killed. But Uzquiano's jurisdiction is limited to the park.

Local police, state police investigators, and the federal ministry of environment have the authority to crack down on illegal trade in towns and cities throughout the country. Bolivian officials say it's important to stop the illegal jaguar trade, but efforts so far have been disjointed and ineffective, according to conservationists, scientists, and government employees.

"I believe the government's efforts are not sufficient," says Angela Nuñez, a biologist who used to work for Bolivia's biodiversity department, focusing on jaguar trafficking. "Political interests are put first. It seems the priority is to maintain good relations between Bolivia and China."

In the case of Yan Yixing, a Chinese national known locally as Javín, police found jaguar heads and teeth during a raid on his home in 2014. Three years after his arrest, he remains free on bail, his trial having been delayed several times.

Biologists say it's not too late to save jaguars in Bolivia, where they're thought to number between 4,000 and 7,000. But that requires a sustained, coordinated effort by the government to curb illegal activities, work closely with Chinese companies, and see prosecutions through.

For now, however, trafficking in the parts of one of South America's most iconic animals remains a low-risk, high-reward business. □



DESIGNING FOR AFRICA is the objective of many new technology ventures. The continent is still a largely untapped market, particularly in remote, off-the-grid places. Mark Kamau, director of user-experience design for BRCK in Nairobi, Kenya's capital, holds a prototype for a mobile weather station.

AFRICA'S TECH

Inspired by Silicon Valley, young entrepreneurs are bringing life-changing innovations to the continent.



GENERATION



THE DESIRE TO TEACH their children about computers drew these Samburu women to a classroom in a settlement north of Nairobi. They are learning about tablets – designed to withstand tough use – that



connect to the Internet through a satellite and come preloaded with educational programs. Technology now has arrived in isolated regions of Africa primarily in the form of relatively inexpensive cell phones.



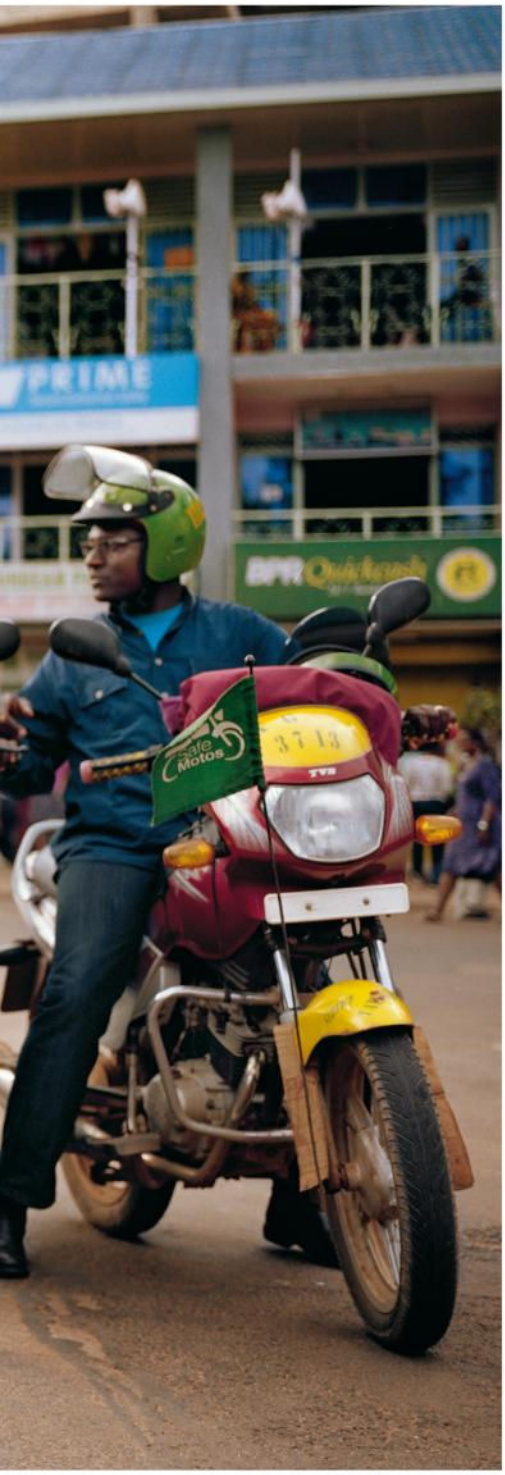
ENTREPRENEURS COLLABORATE at a popular technology-innovation center in Nairobi called iHub, where they share ideas, take classes, and participate in hackathons, competing to solve challenging software



problems. Young, tech-savvy Africans have flocked to Kenya's nascent version of Silicon Valley, nicknamed Silicon Savannah, seeking the money and expertise to create groundbreaking technology solutions.



AN UBER-LIKE COMPANY aims to help riders find safe motorcycle drivers. Peter Kariuki, who taught himself to code as a child, hopes his SafeMotos will transform transportation in Africa, starting in Rwanda.



By **ROBERT DRAPER**
Photographs by **CIRIL JAZBEC**

One day in 2004, in the Kenyan farming village of Engineer—so named because an Englishman once ran a mechanical repair shop there—a slight and nearsighted boy was walking past the only printing shop when his eyes fell on something he had never seen: a computer.

The boy watched as the owner stabbed at his keyboard. Edging closer, he saw pages spew out of a printer. Standing beside the humming machine, the boy stared mesmerized at the words and numbers that had somehow been transmitted from the computer. Almost a teenager, Peter Kariuki had discovered his destiny.

His parents, subsistence farmers of cabbages and potatoes, began to worry that Peter was spending too much time at the printing shop. No one in Engineer had access to the Internet. Few even had electricity. Tech booms were a faraway notion, and talk of random scrawny, bespectacled kids inventing hardware or writing code and cashing out in their 30s had yet to reach Engineer. Regardless, Peter was hooked. When his superb grades in primary school qualified him to attend the prestigious Maseno School (whose alumni include Barack Obama's father), a teacher gave Peter the keys to the computer science lab, where he could code all night long.

In 2010 the 18-year-old computer wizard traveled to Kigali, Rwanda. Kariuki got a job designing an automated ticketing system for the capital city's bus system. Although Kigali was among Africa's tidiest and most crime-free cities, its transit system was woefully in keeping with the norm on the continent. Because the buses (really just



INVESTING IN THE FUTURE, Rwanda has pledged to educate students about the digital world, connect its citizens to the Internet, and build a knowledge-based economy by 2020, a goal reflected in its 500-franc note.

vans) were unreliable, overcrowded, and glacial in velocity, most commuters relied on motorcycle-taxi drivers, who are notoriously reckless. Indeed, throughout sub-Saharan Africa, road accidents are catching up with AIDS and malaria as leading causes of death—and police statistics that Kariuki has seen indicate that in Kigali about 80 percent of road accidents involve motorcycles. These facts riveted Kariuki and his roommate, Barrett Nash, a fellow start-up aspirant from Canada with oversize red-frame glasses. After turning off their laptops for the evening, Kariuki and Nash would stroll through Kigali's red-light district to an outdoor bar where, over Primus beers, they would wrestle with a basic question: How could they provide Kigali with an Uber-like motorcycle-taxi service that was efficient, affordable, and safe?

Kariuki and Nash described their concept in a video posted on a website used to seek start-up money. An accelerator group founded by an American venture capitalist named Sean O'Sullivan reached them by email and offered them an expenses-paid, three-month mentorship in Cork, Ireland. After determining that it wasn't a hoax, Kariuki and Nash quit their day jobs. When Kariuki informed his parents, they consoled themselves with the recognition that a 22-year-old had plenty of time to recover from an early failure.

Kariuki and Nash returned to Kigali in spring 2015 with the finalized software for the concept they had dubbed SafeMotos. Rain clouds were gathering as they climbed on motorcycle taxis. Amid the downpour both vehicles raced heedlessly uphill, just as a truck driver ahead of them threw his gears in reverse. Kariuki flew off his motorcycle. He wound up with a broken kneecap, three missing teeth, and a disfigured lip. Later, when the surgeon who fixed his mouth inquired about his misfortune, Kariuki told him that his motorcycle driver had been in a traffic accident.

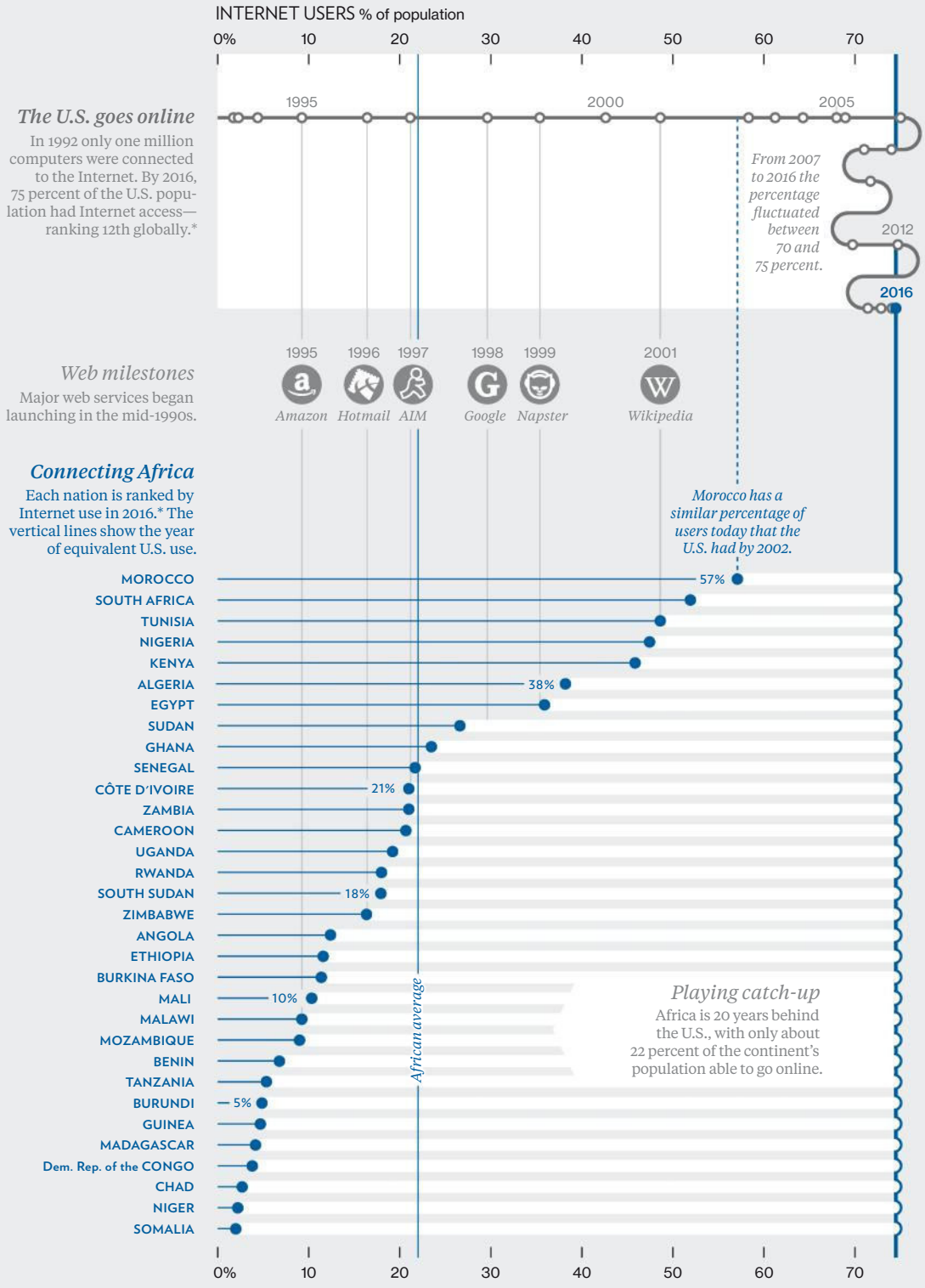
"I see this all the time," sighed the doctor as he proceeded to stitch up Kariuki, who managed a smile. His marketing analysis for SafeMotos was now complete.

TODAY THE RWANDAN START-UP initially funded with $126,000 is the first and largest motorcycle ride–sharing company in Africa. It partners with more than 400 licensed and painstakingly monitored motorcycle-taxi drivers in Kigali, who are likely to make 800,000 trips this year. Gross revenue for 2017 is projected to be $1.1 million. "My dream," Kariuki told me recently on the rooftop balcony of one of Kigali's many sparkling new hotels, "is to establish Kigali as our stronghold that no one can touch—and from there move into 10 other cities."

The pride of Engineer belongs to a wave of digital entrepreneurs who aim to transform sub-Saharan Africa. Their emergence coincides with the ubiquity of mobile phones throughout the continent, as well as the arrival of high-speed Internet—which, as recently as a decade ago, was rare in most of Africa. During the past few years, tens of millions of dollars in venture capital has flowed from the West into such countries as Kenya, Rwanda, Nigeria, and South Africa. The result is a generation of innovators whose homegrown

DIGITAL DIVIDE

Internet access often translates into economic opportunity – but those benefits can be hard to come by in Africa. Billions of people around the globe have gained access to the Internet since the World Wide Web launched in 1991. In many parts of Africa, especially in rural areas, people are still not connected.



*COUNTRIES WITH POPULATIONS MORE THAN 10 MILLION. SOMALIA FIGURE ESTIMATED

ALBERTO LUCAS LÓPEZ, NGM STAFF; KELSEY NOWAKOWSKI. SOURCES: ITU; WORLD BANK; COMPUTER HISTORY MUSEUM

ideas could, in the manner of SafeMotos, improve the lives of their fellow Africans.

This development should not be surprising, despite the many political and socioeconomic travails bedeviling Africa's overall progress. "On this planet only one continent is growing faster than all the others in population, and it's likely to keep growing even faster," says Steve Mutabazi, a chief strategist with the Rwanda Development Board. "I've watched Asian countries enviously, and one thing is clear: When you have a developing region with enough members developing an ecosystem, it generates incredible momentum for investment in that region." Africa, Mutabazi adds, "is at that point now."

Africa's late arrival to the digital economy comes with certain competitive advantages. It benefits from advances and mistakes already made by Silicon Valley. Its population is younger than that of any other continent. Its marketplace amounts to a new frontier. Its largely untapped labor force presents an appealing prospect for tech-assembly plants. "Look at how China and India are competing in the electronics market," says Bitange Ndemo, Kenya's former permanent secretary at the Ministry of Information and Communications and now a professor of entrepreneurship at the University of Nairobi's School of Business. "India is well on its way to becoming a global production center for electronic products. And how? By having so many young people with little to do that they can make things for next to nothing. What other continent can do that? Africa."

It happens that Ndemo was one of the first Kenyans to promote his country's tech potential with the nickname Silicon Savannah. Today he says the hype is warranted. Thanks to the mobile money-transferring innovation launched in 2007 by Kenya's M-Pesa, Africans with a cell phone can deposit and withdraw cash at many shops without having to visit a bank or ATM. Mobile money transfers also are being used to pay for power from solar panels that off-grid-energy companies install on homes lacking electricity. Uber is a fact of life in urban East Africa, as are homegrown car-sharing competitors.





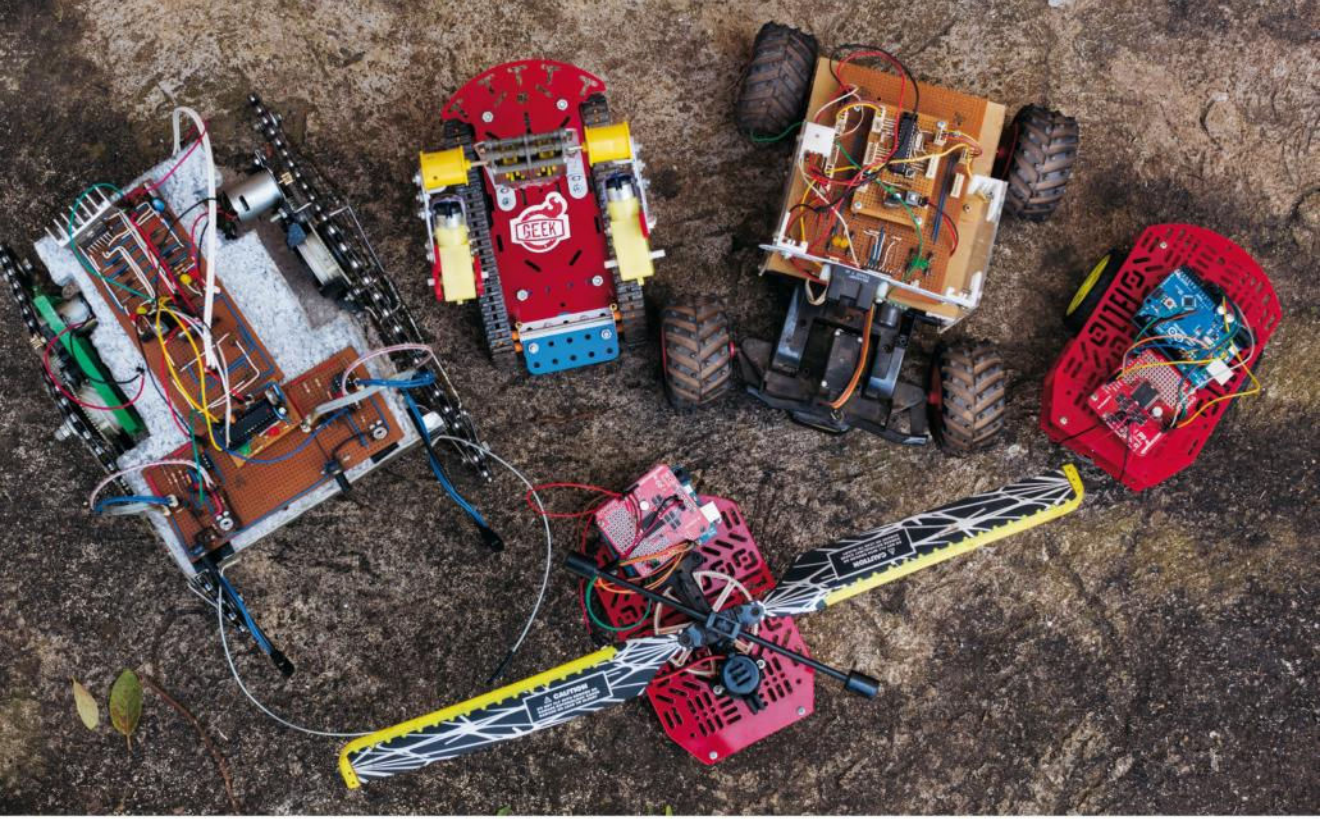
BUILDING TECH CAPACITY, Rwanda partnered with Zipline, a California company, to deliver blood and plasma inside drones, creating technical jobs for people like flight operator Olivier Mugiraneza.



A TECH-ENABLED LOAN made it possible for Eunice Njoroge (right), who lives in Kenya, to spend $200 to buy a pig and some feed. Using FarmDrive, a mobile phone app that keeps farm records, she was able to



demonstrate to a bank that she is creditworthy. Peris Bosire, one of the founders of FarmDrive, shows Njoroge how to get the most from the app. Njoroge has since made all the payments on the loan.



BRINGING ROBOTS TO CLASSROOMS is the objective of Fundi Bots, a company in Kampala, Uganda, that creates kits to encourage students to learn more about such subjects as mechanics and electronics.

New technology spreading throughout the region allows residents to buy groceries, clothing, and other goods online. An app called iCow helps herders manage their cattle populations. Another, named Kytabu, makes it possible for students and teachers in underprivileged schools to lease textbooks on mobile devices. However unwelcome economic disadvantage may be, in Africa it has sparked ingenuity. As Michel Bézy, the associate director of Carnegie Mellon University's Kigali campus, observes, "When you and I need something, we go on Amazon. In the village they have to invent it. I see it with my students. They're much more creative over here."

Nevertheless Bézy—who has also worked on campuses in the Democratic Republic of the Congo, Belgium, and North Carolina—is among those who fear that Africa cannot possibly meet the expectations raised by Silicon Savannah boosters. "Having an idea is fine," he says, but "an idea has no value unless it's executed." Skeptics point out that some 60 percent of sub-Saharan Africans do not have access to electricity. Even for those who can find a way to power up a computer, there are limited opportunities for learning how to excel with it. Bézy notes that only eight of the thousand highest rated universities are in Africa (one in Egypt and seven in South Africa), according to Webometrics, which ranks colleges by analyzing data available on the Internet. The effects of such deprivations are apparent throughout African society.

"The awareness of what information technology can do is very, very low in Africa," Bézy says. "The first time young Africans get computers in their hands is high school. In the U.S. it's at age four. Company executives here have no idea what IT can do for their companies."

Knowing how to use their data has been the least of Peter Kariuki and Barrett Nash's liabilities. Every week the SafeMotos founders email a newsletter to their investors with updated statistics that range from the percentage increase in the number of repeat customers to the safety scores of their drivers. When I visited the SafeMotos office on an unpaved and hilly road west of downtown Kigali, a large computer monitor tracked every trip from start to finish, logging each one for future analysis.

Rather, the challenges facing SafeMotos illustrate the gulf between Africa and Silicon

Valley in skilled technicians. "It's been really hard to find programming talent here," Kariuki says. "So I have to do everything."

After interviewing dozens of applicants and concluding that none possessed the requisite skills to assist in continually modifying the SafeMotos app, Kariuki and Nash resorted to hiring a team of three developers based in Poland. Similarly, in the marketing of their invention—to Kigali commuters, to investors, to potential advertisers on the app, to markets outside of Kigali—they are on their own. Their inability to find like-minded visionaries to join the SafeMotos team speaks to long-standing deficiencies in education systems such as Rwanda's. As Bruce Krogh, the director of Carnegie Mellon's Kigali campus, says, "The whole experience of children in the U.S., almost from the day they're born, is: What do you want to do? Education there cultivates critical-thinking skills. Here it's rote to an extreme. In this culture children are told to stay in their place and not make decisions at all."

But—as evidenced by the successful effort to lure Carnegie Mellon to Kigali six years ago—Rwanda is rapidly becoming an education success story. When Paul Kagame became president in 2000, he proclaimed that his country would have a knowledge-based economy in two decades. "Most people laughed," recalls the development board's Mutabazi. "As recently as 2008 no place outside Kigali had fiber-optic cables. By 2010 the entire country was covered by a network of fiber optics. Twenty years ago the country's entire higher educated population was 4,000. Now it's 86,000."

That progress may not come soon enough to accommodate Kariuki's timetable. Still, Kigali—the largest city in a country that, 23 years ago, was reeling from a genocide that killed 800,000 of its citizens—has become a hospitable incubator for innovations like SafeMotos. It is small, relatively free of corruption, and in a country with a highly proactive national government—different in nearly every way from Kariuki's native country of Kenya, where, he says, "people succeed by hustling, knowing that the bureaucrats won't help them."

IN ANOTHER KENYAN FARMING VILLAGE about 200 miles by road from Peter Kariuki's birthplace, a child named Peris Bosire would sit in a field while her mother harvested maize and would strain to imagine any other sort of life. Everyone she met in Kebuse was a farmer, or a teacher who educated future farmers. Few made any money. The rough roads made it laborious for them to get their crops to market. They simply consumed what they grew and remained trapped in the village's primitive sameness.

But Bosire's fate took a turn at age 10, when her parents sent her to a modest boarding school so that she would not have to make the three-mile round-trip walk to class anymore. Someone had donated seven used Dell desktop computers. The girl's eyes were uncomprehending when she first beheld them. She'd never so much as seen a cell phone. She had no idea how to type. But she was uncommonly intelligent, and before long she understood what those computers represented: Peris Bosire's ticket out of the village.

As with Kariuki, Bosire's grades qualified her for a superior high school, with a bona fide computer lab. She won a national science competition and a scholarship to the University of Nairobi. Her dorm roommate, Rita Kimani, was also from a poor farming community and had a similar way with computers. Bosire and Kimani became inseparable and a nearly unbeatable team on the tech-contest circuit. In mulling over their future, Bosire recalls, "we started looking back at how we grew up and how our parents did farming. And we realized that none of them had ever received a loan to improve their farming activities."

In spring 2014 the two friends began spending their free time interviewing farmers and bankers. While two-thirds of Kenya's workforce is in the agricultural sector, less than one percent of commercial loans in Africa go to farmers. If Bosire and Kimani could convince risk-averse bankers that farmers are capable of using mobile phones to keep financial records and make loan payments, then the two women felt confident they could devise a digital bridge between the financial sector and a vast, untapped, and needy customer base.



GOOD-PAYING WORK has come with some of Africa's tech innovations, such as SafeMotos, which has more than 400 licensed motorcycle-taxi drivers in Kigali. Fred Hakizimana has driven for the company for more



than a year. It's been life changing for him and his family. Now he sometimes makes twice what he did when he drove on his own. With the money, he bought a new house and sends his children to private school.

‘WHEN YOU AND I NEED SOMETHING, WE GO ON AMAZON. IN THE VILLAGE THEY HAVE TO INVENT IT.’

MICHEL BÉZY, ASSOCIATE DIRECTOR, CARNEGIE MELLON UNIVERSITY IN KIGALI, RWANDA



YOUNG WOMEN LEARN TO CODE at an event in Uganda that used curriculum from Rails Girls, a nonprofit started in Finland that aims to teach girls and young women how to build their own web apps from scratch.



Bosire and Kimani launched FarmDrive in May 2015. The digital recordkeeping platform serves as a basis for bankers to establish credit ratings and determine which farmers are best suited for small loans. FarmDrive's pilot program consisted of 50 farmers. Today hundreds of thousands are in FarmDrive's database; about 830 have received financing. In turn the banks pay FarmDrive for essentially functioning as their credit bureau for Kenya's vast farming community. The two entrepreneurs have no intention of stopping there. "There are more than five million small farmers in Kenya," Bosire says. "Throughout Africa it's about 50 million. But when we started FarmDrive, we always had global ambitions. We're building solutions for farmers in Asia too."

In many ways the impulses driving Peris Bosire and Rita Kimani exemplify the best of Kenya's digital scene: They're motivated by a desire to better their communities. Even as they now tour the world speaking at business summits and scoping out other market opportunities, they remain rooted in Kenya. Although they come from impoverished villages, they've benefited in a broad sense from a heightened innovative streak that, for a host of historical and cultural reasons, seems endemic to Kenya. One distinction is that after Great Britain's colonial rule ended, Kenya avoided missteps committed by other African nations. As Ndemo points out, "Since independence Kenya has been a free market economy, where a lot of other countries leaned towards the Soviet Union and experimented with socialism. Uganda had a bad experience with Idi Amin. Rwanda obviously had a very bad experience. In the meantime Kenyans have had more than 50 years of freedom."

But if it's true that Kenya's relative stability has contributed to Bosire and Kimani's success, it's also true—and typical of the Kenyan entrepreneurial experience—that FarmDrive has succeeded with little encouragement from the national government. In sub-Saharan Africa, Kenya and Nigeria have achieved tech preeminence more from venture capital flowing into those large countries than from government action.

"Right now there is no link in Kenya between policymaking, academic research, and the private

ASPIRING TO PROTECT THE ENVIRONMENT through innovative technology, Jessica Chege is studying computers in college near Nairobi. She first became interested in computers when she was 10 years old.

sector—and only the government can forge that link," says Ndemo, who was among the first champions of a 5,000-acre technology hub under construction in Konza, about 40 miles from Nairobi, the capital. It was billed as Africa's first "smart city" at its groundbreaking in 2013, but its construction has been hamstrung by political squabbling and profiteering. As Ndemo understatedly puts it, "The speed is not there."

For now Kenya's version of Silicon Valley is Nairobi's Kilimani neighborhood, in particular a heavily trafficked, ramshackle thoroughfare known as Ngong Road. One catalyst was the influential technology-innovation center iHub, from which a number of homegrown software start-ups have been hatched—among them Totohealth, which helps parents track the health of their babies from pregnancy through early childhood. The University of Nairobi's Kenya Science Campus is situated on Ngong. Across the street is 88mph, a prominent firm that invests in tech start-ups. And not far from iHub's location is FarmDrive's office, quietly positioned in the epicenter of the city's programming community.

Another factor binds Bosire and Kimani to entrepreneurs throughout the city and indeed the continent: In succeeding, they inevitably encounter cultural obligations that can inhibit further success. The mythic start-up stories of Steve Jobs building the first Apples in his parents' garage and of Bill Gates dropping out of Harvard to start Microsoft might be celebrated in the West, but the stakes for brazen risktakers are different in developing countries. "This is the reality of entrepreneurship in Africa," Bézy says. "You're the only educated person in a community of 200 relatives. You're expected to feed that entire family. And in that way your great idea is constrained."

Bézy's observation was on my mind as I accompanied Bosire one afternoon on a drive south from Nairobi so that she could learn how a few farming communities were making use of the loans supplied to them via FarmDrive. Their reports were varied. One farmer had used a $200 loan to expand her well-tended acreage of cabbages and was now ready to apply for a second loan. Another woman who raised pigs had constructed a sturdy water tank for her animals. Some farmers had fared less well. One had encountered family hardships and was struggling to pay back his loan. Another had misused the bank's money on a quick-fix irrigation ditch that had collapsed with the first hard rain. For FarmDrive's purposes the failures were as useful as the successes. Together they would present a more complete database that would help banks determine lines of credit. Ultimately every farming community in Kenya could benefit from Bosire's research—including Kebuse, the village where she was raised. But that wasn't yet obvious back home, as Bosire acknowledged to me when I asked her about the communal pressures on African entrepreneurs. Sighing, the 25-year-old woman said, "My mom and I are having a big fight right now. She doesn't get it. 'Why aren't you sending more money back home? Why don't you have jobs to give to your cousins?'"

Perhaps Bosire's mother will see things in a more appreciative light once FarmDrive comes to her village. "We Africans sometimes resist change," admits Patrick Wakaba Kariuki, the father of the SafeMotos co-inventor. He had been fretful when his son decided not to attend college in Nairobi to become an entrepreneur. But last year he flew to Rwanda to visit his son. The farmer marveled at Kigali's clean streets. It was evident to him that a young man could do business there. And when he climbed onto the back of one of the motorcycles in his son's fleet, strapped on a helmet, and took off, he found himself gliding through more than time and space. He was departing the simple, predictable ways of the village for an uncharted savanna.

"I was able to understand," recalls the farmer, who returned to Engineer—where one day, thanks to dreamers aglow at night by computer screens, the future would also come. □

Robert Draper, based in Washington, D.C., is a contributing writer for *National Geographic.* **Ciril Jazbec,** a freelance photographer who lives in Naklo, Slovenia, spent two years documenting the tech scene in East Africa. This is his second feature for the magazine.


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Young, Alone, and Stranded

Stuck in Serbia, thousands of refugee children traveling by themselves dream of asylum in the EU. It doesn't want them.





Shershah, age 15, from Afghanistan, takes shelter in a derelict train car at Belgrade's central railway station. Recent years have seen a jump in the number of unaccompanied children escaping hardship and conflict.

BY **RANIA ABOUZEID** PHOTOGRAPHS BY **MUHAMMED MUHEISEN**

Delagha is a shy, skinny eight-year-old with weary eyes, a child who seems older than his years, aged by experiences that most adults never face. When I met him at the Adasevci refugee center near Serbia's border with Croatia, he was walking around aimlessly, killing time.

At an age when many children aren't allowed to cross the street without an adult, Delagha had left his home, his parents, and his four younger siblings in Afghanistan's war-ravaged Nangarhar Province more than a year ago. With a 10-year-old cousin and 15-year-old uncle, and aided by smugglers, he had crossed continents on a nearly 4,000-mile odyssey from his Taliban- and ISIS-infested hometown of Jalalabad, through Pakistan, Iran, and Turkey and into Bulgaria and Serbia. His dreamed-of final destination: the European Union, specifically, France.



Delagha is one of at least 300,000 refugee children globally who made similar fateful journeys without adults in 2015 and 2016—a fivefold increase over previous years. They joined an unprecedented global flow of people fleeing hardship or oppression. At least 170,000 of those minors have applied for asylum in Europe. Michel Saint-Lot, UNICEF's representative in Serbia, says that 46 percent of the 7,000 or so refugees in Serbia this past May, when I was there, were children. Most are from Afghanistan; one in three is unaccompanied by an adult.

Delagha is stuck in Serbia now, stranded by border clampdowns since March 2016 and the tightening of the so-called Balkan route into the EU. Adasevci—one of 18 facilities in Serbia that provide food and accommodation for refugees—is a converted motel. Families are jammed into its rooms; single men and boys crowd into surrounding canvas-covered hangars.

"There is nothing here," Delagha said as we walked back to his hangar. The gray T-shirt and the black scarf around his neck did little to shield him from the chill that spring morning, and goose bumps rose on his scabies-infected skin. He wanted to get to France because "there is peace in France." There is peace in Serbia too, but Serbia isn't his imagined EU utopia.

According to Saint-Lot, children like Delagha who risk continuing their journeys are prey to thieves, sexual predators, and smugglers. "I tell them, 'Isn't it better here than where you were?'" He was concerned about reports that minors sneaking into EU countries have been detained, beaten, or forcefully returned, in violation of ratified conventions. "Most of them don't want to be here—they feel stuck." Some children, he says, are "breaking down emotionally because they don't know what's next. They don't see any future."

In Serbia, Delagha has nothing of home but memories—of mortar fire, fighting, and Taliban thugs, but also of playing cricket with friends and sharing meals with his family. "I remember happy days," he said. "I am sad here."

He hasn't told his parents that he and his cousin and young uncle were beaten and robbed in Iran by "people like Taliban, carrying machine guns." Or that his uncle hid money in Delagha's underwear, hoping thieves wouldn't search a small boy. But the horrors of the journey weren't as bad as the squalid, dilapidated warehouse near Belgrade's central railway station where he'd spent the previous winter, squatting with other refugees without heat, sanitation, or electricity. It was freezing cold. Sometimes, the young boy admitted, he wished he could return home. "I'm not very happy." He didn't know what to do next. "Nothing," he said. "Now I can do nothing." ▯

To support refugee children, consider giving to Muhammed Muheisen's *everydayrefugees.org*.

NGM MAPS



Old beyond his years, Delagha, eight, has not told his parents in Afghanistan about his brutal journey to Europe: “They asked if I faced a hard time, but I said ‘No,’ as I didn’t want them to worry.”



MUHAMMED MUHEISEN, AP

Above: A 14-year-old boy from Afghanistan washes himself on a frigid day in Belgrade. Few if any lone refugees are girls, according to UNICEF Serbia, given the grave threat of sexual and physical abuse and their mostly patriarchal cultures. Below: Boys gather in an abandoned warehouse in Belgrade that was later demolished to make way for a new property development; they were moved to government-run shelters.



Above: Asadullah, 11, an Afghan (standing), prays in Sid before trying to sneak across the nearby border into Croatia. Guards turned him back. Undeterred, he still hopes to join a cousin in the United Kingdom. Below: A glimpse inside the refugee center in Obrenovac, one of 18 across Serbia that provide food and accommodation but little else to fill the day. Unaccompanied children are generally housed apart from families and men.


زاخیل
ZEKHEL



Hamid, 16, cooks in an abandoned space in Sid. UNICEF's Michel Saint-Lot says he hopes children like Hamid will apply for asylum in Serbia rather than risk continuing their dangerous journeys.



OUT OF EDEN WALK · PART SIX

Spirits of The Silk Road

A 1,500-mile walk along the famous trade route recalls a time when the world came together in Central Asia.



A traditional sheepskin coat blows in the wind in Turtkul, Uzbekistan, on a highway that follows the ancient Silk Road. It wasn't a single road but a network of commercial routes that once traversed much of the Eastern Hemisphere.



Islambek Akhmaghambetov, a laid-off oil worker, has a snack at a truck stop diner in Kazakhstan's oil-rich Mangghystau region. Oil replaced many commodities once traded along the Silk Road, but low prices have led to flatlining employment.


PARLIAMENT



Two brothers and their brides wait to be married in a lavish ceremony at a wedding hall in Tashkent, Uzbekistan. The city, now the country's capital, was long a stopping place for camel caravans plying the Silk Road.



By Paul Salopek
Photographs by John Stanmeyer



Water. Clean, fresh, drinkable water.

For more than three years I have struggled to find it. I am crossing the world on foot. I am retracing the vanished trails of the first human beings who explored the planet in the Stone Age. At my journey's starting line in Ethiopia, I walked from camel watering hole to muddy salt seep. I have plodded from oasis to oasis in the Hejaz desert of Arabia. In the winter peaks of the Caucasus, I have grown thirsty surrounded by tons of water—the vital liquid frozen to rock-hard ice.

But never before have I encountered this: Someone has dug up and looted my resupply cache. A shallow pit that once held 15 precious gallons of water. My water. I cannot tear my eyes from the emptied jugs, rocking gently in a scorching wind.

Jinn have stolen my water in the Qizilqum.

What are jinn?

Vagrant spirits—according to steppe nomads—that haunt the incessant horizons of Central Asia, afflicting or aiding travelers in turn. Often called genies in the West, where they are usually depicted in cartoonish pop culture as turbaned demons corked inside lamps or bottles, jinn can fly hundreds of miles at night, the region's herders say. Or: They can change themselves into snakes and wolves. Marco Polo, while traversing the Desert of Lop in western China, reported the presence of wily jinn that called out to caravans by name, "and thus shall a traveller oft-times be led astray so that he never finds his party. And in this way many have perished."

And where is the Qizilqum?

Stretching from parts of Kazakhstan to southern Uzbekistan: an infamous desert the size of Arizona that for centuries has thinned the ranks of passing caravans on the Silk Road, the most famous trade route in history for more than 2,200 years. Even now its vast gantlet of blistering light and thorn scrub presents a formidable



Children in Aqtau, Kazakhstan, play on a crumbling pier jutting into the Caspian Sea, the largest inland body of water on Earth. Aqtau has long been Kazakhstan's sole seaport, connecting the country's trade routes with Russia, Azerbaijan, Iran, and Turkey.

barrier to travel. It certainly has stopped me.

"Don't blame the *choban,*" my guide Aziz Khalmuradov says, referring to local shepherds. Khalmuradov is a proud Uzbek. Yet I can tell even he is stunned. "Stealing water is a big crime here," he says, kneeling in exhaustion beside our plundered depot. "Nobody would dare."

But if not the shepherds, then who?

Khalmuradov and I slog up a scalding pink dune. We use a satellite phone to summon help from Buxoro, a fabled oasis city that's a two-day walk away. We sit. We watch the burning horizons. We wait. In the eighth century a trader to the northeast of us, near a Chinese town called Turpan, paid 40 bolts of raw silk for an 11-year-old slave girl. To the southeast, a thousand years before that, Alexander the Great risked his conquering legacy when he forded the Oxus River on flimsy rafts stitched from his men's leather tents. And today all around us, Beijing is pouring a trillion dollars into rebuilding a modern Silk Road trade network across Eurasia. How much would I





The Registan is the square in the heart of the ancient Silk Road hub of Samarqand, now a World Heritage site in Uzbekistan. Restoration of its medieval architecture began decades ago under the former Soviet Union and continues today.





Women cover their eyes in prayer during *betashar*, a Kazakh ritual in which the bride reveals her face. Weddings can be hours-long affairs, marked by family negotiations before the bride is accepted into the groom's family.

give for a mouthful of water? How old is this Silk Road moment?

The sun sets in a chrome sky. Long after midnight an iota of light winks into existence in the matte darkness of the Qizilqum. It begins to circle us, first close, then far, then close again. A taunting lodestar. "Our rescue car is lost," Khalmuradov rasps. He waves his headlamp frantically at the light. But I know better. I keep my cotton-dry mouth shut. It's jinn.

A FEW USEFUL ADDENDA to some standard Silk Road myths:

It wasn't a road.

Less a highway, it was a diffuse web, a shifting skein of thousands of camel trails, mountain-pass bottlenecks, turreted caravansaries, river bazaars, seaports, and lonely desert cairns (spaced eyeshot apart for navigation) that bound together the two great economic centers of the classical world, Han China and the Roman Mediterranean. At its geographic crossroads in Central Asia, where kingdoms of middlemen grew rich, the Silk Road's goods flowed radially in all directions. North to the Russian principalities. South to Persia and the Indus. West to Constantinople. East to Xian. This network of commerce linked tens of millions of lives as far away as Africa and Southeast Asia. The Silk Road wasn't a camel rut worn in the steppe. It was an idea: the prototype for globalization.

The Silk Road wasn't a camel rut worn in the steppe. It was an idea: the prototype for globalization. Silk was only its brand.

Silk was only its brand.

A thousand and one other products swayed on camelback along the Silk Road's sprawling distribution system. Chinese gunpowder. Venetian glass. Samarqand paper. Snow leopard skins. Porcelain. Levantine gold. Exotic animals. (A khan of Khiwa once ordered two water buffalo from Persia to be goaded across the Central Asian deserts to his walled city.) And of course God: Buddhism, Christianity, and Islam each coursed along the Silk Road. So did revolutionary innovations such as algebra. So did the bubonic plague. (Scholars think the Black Death first infected Europe at the siege of Kaffa; Mongols catapulted the poxed corpses of their own soldiers over the walls of the Crimean city.) Still it is mostly the silk we remember: an ethereal fabric that ripples like moonlight on water. This Chinese invention so entranced Roman elites that they nearly bankrupted their empire to buy it. Some things never change.

There is little truly "old" about the old Silk Road.

Today Muslim Central Asia—the main backdrop of Silk Road history—may seem like a forgotten backwater in the current of global news. Lightly populated, underdeveloped, and mostly authoritarian, the former Soviet republics that straddle the Silk Road's antique caravan trails—Kazakhstan, Turkmenistan, Uzbekistan, Kyrgyzstan—attract little outside attention. Their visitors are nostalgia tourists, romantics drawn to Silk Road glories that faded before Columbus. But this musty reputation is deceptive. Just as powerful empires fought for control of the Silk Road's riches centuries ago, Asia's fulcrum remains a cockpit of 21st-century geopolitics. The United States, China, and Russia each jockey for their interests in the strategic region: fighting Islamic terrorism, opening lucrative trade corridors, tapping energy reserves.

As for jinn, they have bewitched landscapes of Central Asia since before silk was spun. In Islamic tradition, angels were created from light, humans from clay, and jinn from smokeless fire. Jinn have their own kings, towns, and caravans. They are invisible until they aren't. They don't like iron. They squat in empty houses. (Don't sleep there.) A few have converted to Islam and

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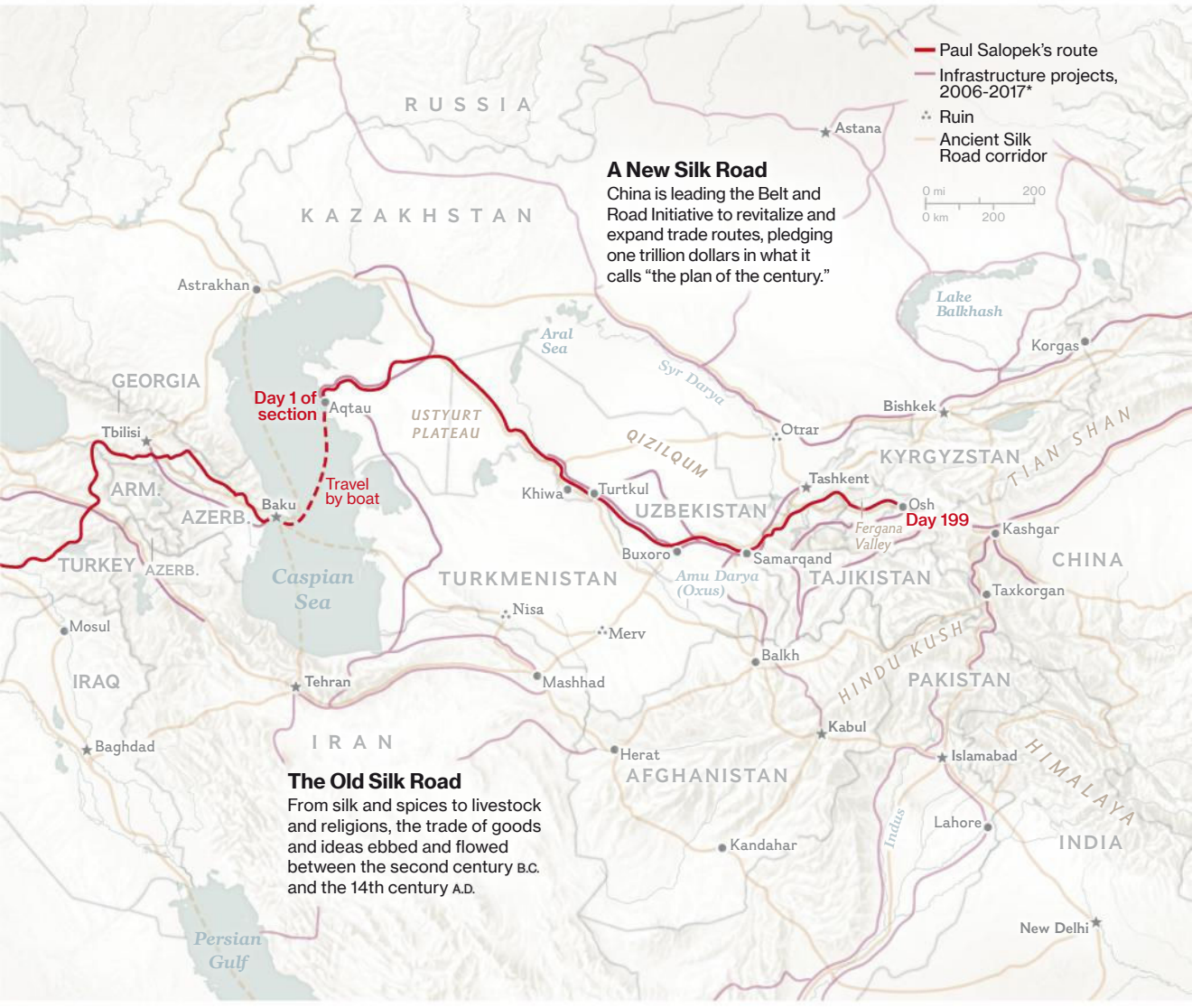
HISTORY Discover the Silk Road's ancient roots at *natgeo.com/history/silk-road.*

Crossroads Revival

More a network than a single path, the Silk Road emerged over centuries of interaction and trade. Routes shifted as empires rose and fell; traffic declined after the rise of maritime trade. Regional powers now want to revive these historic commercial lifelines to better connect Asia with Europe, and beyond.



Paul Salopek's 21,000-mile journey on foot traces human migrations from East Africa to Patagonia.



*INCLUDES BELT AND ROAD INITIATIVE AS WELL AS OTHER PROJECTS. LAUREN C. TIERNEY AND RYAN T. WILLIAMS, NGM STAFF
SOURCES: PATRICK WELLEVER; RECONNECTING ASIA PROJECT, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

are peaceable, but most wish us harm. If you encounter a strange herder on the steppe, look down: If his feet are on backward, he's a jinni.

MY WALK across Central Asia starts at the Caspian port of Aqtau, Kazakhstan. Two improbable guides join me. Daulet Begendikov, a former Kazakh judge, fires a starting pistol at the stars every night to ward off steppe wolves (and jinn). Talgat Omarov, a halal butcher–shop owner, is so devout he refuses to be photographed. He hides behind the packhorse whenever I finger a camera. (Conservative interpretations of the Quran prohibit graven images.)

In May the Kazakh steppe is distilled to a diptych: a band of chlorophyll seamed against a sky of lapis. We wade leglessly from sunup to sundown through a pale green mist. This is a half million square miles of ripening grass. We rake our opened fingers through its shining seed stalks. Wild stallions charge our tired cargo animal. We peer into our useless mobile phones, hoping for messages of love. And from day one we begin bumping into the Silk Road's new silk: hydrocarbons.

Kazakhstan is the world's 15th largest crude oil producer and a major supplier of natural gas. Thousands of miles of pipelines craze its western grasslands. These steel conduits cannot be crossed. So they offer our shambling caravan a binary choice: turn left or turn right. In this way, pivoting at sharp angles, we are eventually funneled toward the eerily unattended pumps, well pads, collecting stations, and gas flares of an automated oil field.

The brief history of the Karakuduk oil patch describes in miniature the economic future of Central Asia.

Explored and developed after the fall of the Soviet Union by the American firm Chaparral Resources, the prospect—surreally remote, an industrial complex marooned in an ocean of grass—was acquired by Lukoil, the Russian oil giant, before ending up in the hands of the Chinese company Sinopec. Washington may have troops in Afghanistan, and Moscow may be hoping to reaffirm its grip on the region with its Eurasian Economic Union. But it is China, the original Silk Road engine, that is emerging as the ultimate power broker in Central Asia. Oil fields aside, Beijing is investing in the largest infrastructure project in the world—the Belt and Road Initiative, which aims to build ports, railways, superhighways, and telecommunications systems uniting a colossal Old World consumer market touching 60 countries. The new Silk Road is Chinese.



"How did you get here?" asks a Mr. Liu, the startled Sinopec boss in the oil field's control room. "And would you like tea?"

But Mr. Liu is not thinking about tea. Nor is he concerned with how much chicken loaf, mashed potatoes, plum juice, and apple cake is being consumed by the three filthy wild men who have



A Soviet-era passenger jet looms outside a café in Andijon, Uzbekistan, a key stopping point on the old Silk Road. The city was the site of a government massacre in 2005, when military forces fired into a crowd of people protesting the country's economic and political conditions, killing more than 700 people.

invaded his canteen. (For me the micro-lawns and containerized buildings at Karakuduk shimmer like Coleridge's fantasy khanate of Xanadu: Its hot showers and air-conditioning are "a miracle of rare device, / A sunny pleasure-dome with caves of ice!") No. Mr. Liu is worried about safety. We have somehow breached the oil field's 10-mile-wide security core without tripping elaborate rings of motion sensors.

A company guard escorts us politely off the property. He stands beside his car for a long time, staring us back into the glistening Kazakh plain. Cumulonimbi are dragging their purple skirts of rain through a yellow sunset.

To the overalled inmates of Karakuduk, we are jinn.

MARCO POLO gets star treatment. But many others walked the old Silk Road.

Ibn Battuta, the tireless Arab traveler, spent three decades roaming the East from Morocco along branches of the trade route. Hindu warriors



Women weave silk at the Margilon Crafts Development Center in Margilon, Uzbekistan, a way station on the Silk Road. The center was established in 2007 to preserve and revive traditional crafts such as carpet weaving, block printing, and embroidery. Classes are also taught on how to breed silkworms and create textiles.



attacked him in India. He survived, though stripped of his fine robes.

Xuanzang, a seventh-century Chinese Buddhist monk, walked thousands of miles of the Silk Road, crossing the Hindu Kush where few modern climbers dare. He noted the vibrant multiethnicity of its market cities, such as Kashgar, where he spotted people with "blue eyes" and "yellow hair," perhaps Sogdians. The Iranian-stock Sogdians were the ultimate deal closers of the Silk Road. Sogdian mothers spooned sugar into their babies' mouths to sweeten their tongues for future bazaar haggling.

Then there is the American archaeologist Langdon Warner. In 1904 as a swashbuckling Harvard graduate, he left a dig in Turkmenistan and bluffed his way through Russian-controlled Central Asia, carrying in his saddlebags only "a change of underclothing, a toothbrush, and a revolver." As an adviser to the U.S. Army during World War II, Warner is credited with persuading the U.S. military not to firebomb ancient Japanese cities like Kyoto. That claim has been challenged. So has the idea that he partly inspired the film character Indiana Jones.

WE PLOD ON.

The sun melts a white hole in the sky. The summer steppe is sweltering. Cloudless. Windless. We create our own paltry wind by walking.

To a remote Kazakh village: An inventive woman named Adiana Mairambayeva mixes her koumiss—the nomad elixir of fermented mare's milk—in a shiny Chinese washing machine.

To countless *chaikhanas:* The mom-and-pop teahouses are dropped like dusty boots beside a new Silk Road highway roved by truckers from Turkey and Iran.

To a border checkpoint goodbye: A man with a gun there barely glances at my visa and doesn't touch my rucksack but growls menacingly, "Are you carrying any religious literature? A Quran?"

Uzbekistan's police state is a fortress against jihadism in Central Asia. Its ABCD-arium of security agencies patrols against men with Islamic beards and assigns spies to every mosque. Its religious paranoia is notorious. But the neighborhood is tough. Afghanistan rumbles next door, attracting Uzbek recruits to fight alongside the Taliban. Uzbek fighters have flocked to the Islamic State in faraway Syria. And even while walking in relatively placid Kazakhstan, I hear rumors of evil jinn influencing human affairs: Islamist militants attacking a national guard base and gun shops to seize weapons in the name of divine revolution.

The paradox of Islamic extremism today is that the historical caliphate that jihadists so desperately wish to resurrect would likely repel them. At the height of its power in the Middle Ages, the Muslim world flourished precisely because it wasn't fundamentalist—it was tolerant, open, inquiring. The freewheeling and polyglot spirit of the Silk Road was one key to this. "Central Asia was a major center of learning at that time," says Shakhzukhmilzzo Ismailov, a historian at the Khorezm Mamun Academy museum in Uzbekistan. "We produced many world-class scientists."

I meet Ismailov after trekking a lonely rail line for 24 days across the desolate Ustyurt Plateau to Khiwa.

Khiwa.

If this name conjures anything for outsiders, it is not cosmopolitanism, scholarship, or broad-mindedness. Instead the city evokes the slow decline of the fabulous Silk Road world, when European shipping broke the monopolies of Central Asian traders, dooming oasis stops like Khiwa to exotic backwardness. By the early 19th century the mud-walled outpost had decayed back into medieval stasis. British and Russian secret agents jockeyed for favor with its xenophobic, head-chopping khans in a colonial struggle for dominance in Central Asia called the Great Game.

But my interest in the region stretches back earlier—to a period spanning the eighth to 15th centuries. At that time Silk Road entrepôts in Uzbekistan such as Khiwa, Buxoro, and Samarqand rivaled or even outstripped Europe in intellectual achievement. This was the Arab Golden Age of science, art, and culture, when Baghdad hosted an influx of sages from the far-eastern rim of the caliphate—from what are today the "stans" of Central Asia and parts of Iran.

One Silk Road genius, Al-Khwarizmi—the

At the height of its power the Muslim world flourished precisely because it was tolerant, open, inquiring. The freewheeling and polyglot spirit of the Silk Road was one key to this.



National Geographic Fellow Paul Salopek feeds his donkey Mouse after another day foot-slogging through Uzbekistan's Qizilqum desert. The sands were littered with potsherds from centuries of prior caravans. Follow his global storytelling walk online at *OutofEdenWalk.org* and on Twitter (@PaulSalopek).

word "algorithm" is a Latin garbling of his name—helped invent algebra. He calculated the length of the Mediterranean (correcting Ptolemy). The Central Asian polymath Al-Biruni wrote more than a hundred books, among them a detailed anthropology of India and a study titled *The Exhaustive Treatise on Shadows*. (Al-Biruni observed that jinn were "the impure parts of the erring souls, after they have been separated from their bodies, who [the souls] are prevented from reaching their primal origin, because they did not find the knowledge of the truth, but were living in confusion and stupefaction." Which sounds plausible to me.)

The Silk Road's noisy bazaars of alien products and ideas—Renaissance European, ancient Greek, Indian, Persian, Chinese—stoked this intellectual explosion. So did a new school of religious thought called Mutazilism, which injected rationalism and logic into Islamic religious doctrine, fanning scientific inquiry. "There were practical reasons too," Gavkhar Jurdieva, an architect in Khiwa, tells me. "To survive in this desert you need farming. And to farm, you need to understand irrigation, and that requires engineering. We used math to feed ourselves."

Ultimately it couldn't hold. Weakened by dynastic struggles, the caliphate began to crack at the edges. A purifying movement called Asharism took root against "outside elements" of thought: This smothered most fields of scholarly research beyond religious study. The Mongols sacked Baghdad in 1258. The light of a gilded era blinked out.

Busloads of tourists now ogle Khiwa's relict palaces, madrassas, minarets. The Uzbek government has bottled the Silk Road's faded glories into an open-air museum. I park two cargo donkeys in a nearby village. I sit sunburned and lip cracked in a posh café. The cappuccino machine hisses like jinn. Sipping its magic, I think about





Surrounded by gift-giving friends and relatives, five-year-old Beknur Bakhtiarov has just undergone a traditional circumcision at his home in Khiwa, Uzbekistan. The day began with a formal community gathering and ended with a party.

how few people in the world today know how a light bulb works. About the willful ignorance behind climate change denial. About the closing of the public imagination in the West and the resurgence of populism, of tribal nativism. It is an instructive time to be rambling the Silk Road. I imagine the marble lions outside the New York Public Library preserved one day as artifacts under glass, much like Khiwa.

> Kublai Khan to Marco Polo: *Is what you see always behind you?... Does your journey take place only in the past?*
> Narrator: *Futures not achieved are only branches of the past: dead branches.*
> —From Italo Calvino's novel *Invisible Cities*

I AM STOPPED by police 34 times while walking the hinterlands of authoritarian Uzbekistan.

Along the steamy Amu Darya—the modern name for the Oxus River—villagers sometimes turn my micro-caravan away from their doorways, apricot orchards, melon fields. They apologize: They want no problems with the security forces. Most surrender to their natural hospitality as I walk away. They send out their children with armfuls of *non*—disks of warm, delicious, mud-oven-baked bread.

I once asked a Kazakh wolf hunter, Karim Junelbekov, what to do if approached by jinn on the Silk Road. "No matter what it does, no matter how frightening it is, don't panic or show emotion," Junelbekov said. "Just sit down on a rock and wait. It will lose interest. It will go away." This seems good advice in cultures of fear everywhere.

The planet creaks underfoot, carrying me forever east, toward sunrise.

I circumvent the dying Aral Sea, depleted in Soviet times for "white gold"—cotton. I walk past the last traditional papermaking mill in Turkic conqueror Tamerlane's capital, Samarqand. (The earliest evidence of paper in Central Asia dates to the fourth century. It consists of a bundle of letters a wife wrote to her wandering husband, perhaps a trader. "I would rather be a dog's or a pig's wife than yours," she wrote. It appears that the 1,700-year-old Dear John note was never sent.) And in November 2016 I climb an outlier of the Tian Shan range and roll through blowing snow into the Fergana Valley, into Margilon.



Margilon: the only silkmaking town remaining in Uzbekistan.

"We must find the loose ends and unravel them," says Inoyatkhan Okhunova, a grandmotherly silkmaker who has worked for more than 30 years at the Yodgorlik silk mill. "It is best not to break them. This takes practice."

Okhunova is referring to the thousands of moth cocoons that are unspooled one arm's length at a time in large, dented tin basins of soapy water. The miracle of silk comes from fibers spun by the caterpillar of *Bombyx mori,* a sightless, flightless, hairy insect. Each cocoon



Bronze camels at the Afrasiab Museum, in Samarqand, commemorate the city's long trading history. For hundreds of years Samarqand was one of the most vibrant and sophisticated crossroads between East and West, a magnet for merchants and intellectuals who came here to exchange goods and ideas.

holds roughly half a mile of filament that is about .00039 inch in diameter. Such is the fragility of the lustrous thread that bankrupted Rome. That built thousands of caravansaries across Central Asia, where traders sipped clean water from faucets while London's unwashed citizens waded through ankle-deep slops. That once bound the world together: east and west, north and south. No jinni's sorcery is more powerful than this.

The Fergana sky is waxy, overcast, and cold. The sun hangs dully in it, a pale cocoon. On the frozen road ahead strides Tolik Bekniyazov, my lanky donkey driver. A taciturn nomad. At some old trailside camp he noticed me squinting with book-ruined eyes, toiling to spear a licked thread through the eye of a needle, perhaps while mending my coat. Soon we will part ways at a new border. I will discover many days later, shaking my head in wonder, that he has threaded and knotted every needle in my sewing kit.

We are all weavers. This is the only lasting lesson of the Silk Road. □

RISING ABOVE

In the years since Superstorm Sandy battered homes along the New Jersey coast, residents have been putting them back up. Way up.



A house on Berkeley Lane in Seaside Park, New Jersey, appears poised to make a fresh start: raised and waiting for a new foundation, stripped to bare framing and plywood.



Story and Photographs by Ira Wagner

Normal, simple houses designed to be at ground level take on a whole different look up in the air.

After Superstorm Sandy slammed into the New Jersey shore in 2012, people whose houses were still standing began having them raised—lifted on temporary pilings so that permanent foundations could be put in. Some did it to meet new construction codes or to reduce their flood insurance rates. But for others, I think, it was just a heartfelt bid to stay where they had sunk their roots, no matter the surroundings.

For 25 years I've vacationed with my family at the Jersey Shore, where beach communities are strung along 127 miles of coastline. In 2013 I began taking photos to capture the groundswell of house raisings and the strangeness of what it all looks like. We tend to think of buildings as fairly permanent—but when you see how a house can be dug underneath, lifted up, moved around, pulled, and tossed, it challenges that view.

Some homes had little Sandy damage; many had a lot. Raising a house can add as much as $150,000 to repair costs and prolong the disruption that homeowners already have endured.

Working on this photo project has made me question the wisdom of what we're doing. We keep rebuilding after events like Sandy—despite scientists' warnings that in the future, climate change could make sea-level rise and extreme weather even worse. We haven't wrestled with the bigger question of whether some locations simply are no longer safe or practical for habitation.

When big storms hit, we see dramatic pictures in real time, and they tug at us. What happens later gets less attention but is no less important: It's the dirty, determined work of reclaiming a place and rising from the rubble. □

AS TOLD TO PATRICIA EDMONDS AND JENNIFER PRITHEEVA SAMUEL













Clockwise from top left, rising above Superstorm Sandy in New Jersey: On Paul Jones Drive in Brick Township, a large home sits on a dozen supports; on Bay Point Drive in Toms River, the garage is open but unreachable; on Mizzen Road in Toms River, a classic colonial still has one topiary-style planting; and at the corner of Kingfisher Way and Grand Central Avenue in Lavallette, a house with blue siding towers over its neighbors.



On Pine Street in Union Beach, New Jersey, the flowers in the window boxes may be plastic – but to me, they represent the homeowners' attempt to return to normalcy.


310
50

FURTHER

A GLIMPSE OF WHAT'S NEW AND NEXT

GORILLA DOC

By Nina Strochlic

In 1985 Dian Fossey hired veterinarian James Foster to join her research station in Rwanda as the first "gorilla doctor." A few weeks later Fossey was murdered, but Foster still came to open his clinic. Today 15 vets working for the Gorilla Doctors organization care for the world's last 880 mountain gorillas, which live on the border between Uganda, Rwanda, and the Democratic Republic of the Congo (DRC).

Gorilla Doctors Eddy Kambale and Martin Kabuyaya trek every month into the jungles of Virunga National Park in the restive eastern part of the DRC. They check each gorilla's health and treat any injuries, even performing surgery if necessary. But Virunga is also home to the other kind of guerrilla, and sometimes the veterinarians encounter armed rebels blocking the way to their patients. "The first thing is to engage their leader in conversation," says Kambale. "I tell them, 'I'm just a vet.'"

Last year the doctors took on an additional role: first responders. In the supply room of their lab in Goma, Kambale opens a box of crinkly hazmat suits. In the past three years the DRC has battled two Ebola outbreaks. If the virus comes to this area, Gorilla Doctors will be dispatched to track the source and help contain the disease before it reaches the remaining mountain gorillas and the humans who live near them.

An orphaned gorilla explores a sanctuary in the DRC with Gorilla Doctors staff. To go FURTHER into Dian Fossey's legacy, watch *Dian Fossey: Secrets in the Mist* at 9/8c on December 4 on National Geographic.

PHOTO: MOLLY FELTNER, GORILLA DOCTORS

THE INTERNATIONAL WOMEN'S MEDIA FOUNDATION PROVIDED A GRANT TO SUPPORT THIS STORY.



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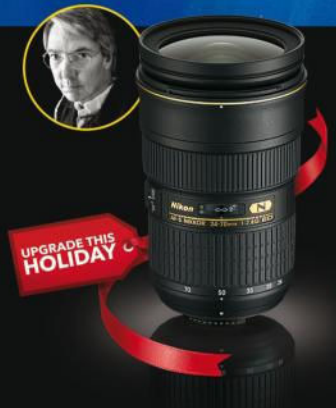
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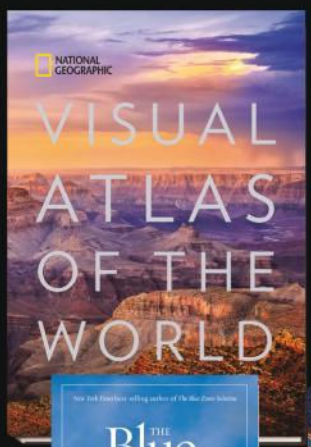
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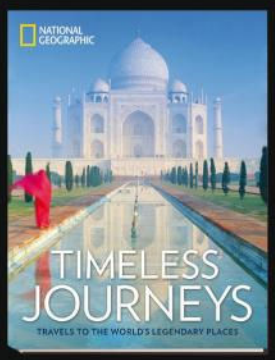
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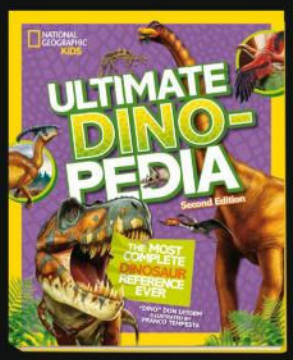


BOOKS MAKE GREAT GIFTS

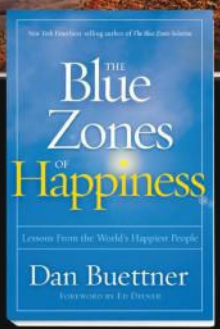
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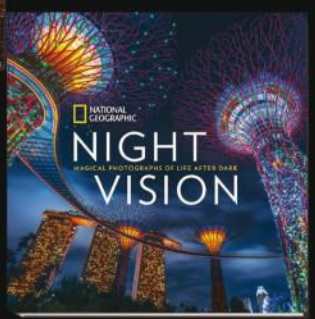




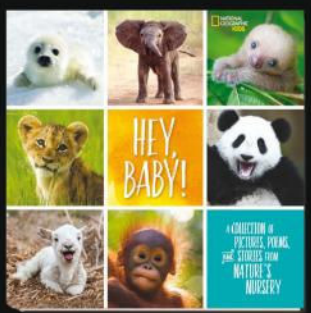












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